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ABSTRACT

Research was conducted to identify criteria for successful research and development innovations in vocational education. Sixteen research and development (R&D) impact criteria were identified through a search of three data bases. The central data base consisted of impact studies of 28 selected state-developed and National Center for Research in Vocational Education products, conducted between 1978 and 1982. The second data base was a computerized ERIC search of 267 impact studies of educational innovations. The third data base was seminal theoretical works and research studies from innovation diffusion literature. After criteria were identified, reviewed, and revised, they were classified within one of five R&D program improvement stages: development, dissemination, implementation, utilization, and effects. Impact criteria were defined for each stage, and salient features of each criterion were illustrated by a case example from an impact study. Guidelines and caveats for using each criterion were recommended. It was concluded that impact potential can be built into R&D products if specific criteria and guidelines are met throughout the R&D process. (KC)

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R&D IMPACT CRITERIA FOR IMPROVING VOCATIONAL EDUCATION PROGRAMS

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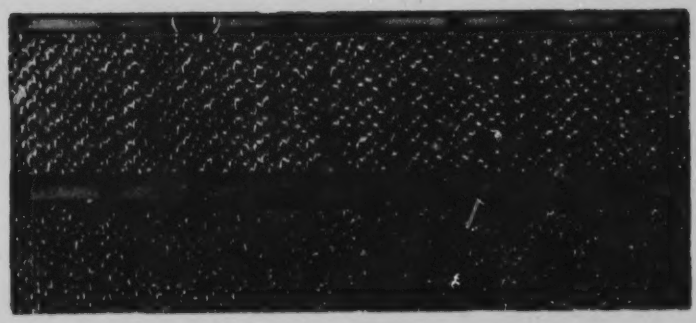

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TABLE OF CONTENTS

		Page
LIST OF FIGURES		v
FOREWORD		vii
EXECUTIVE SUMMARY		ix
I.	INTRODUCTION	1
	Purpose and Objectives	4
	Methodology	6
	Limitations of the Report	7
	Toward a Conceptual Framework of R&D Impact	7
II.	R&D IMPACT CRITERIA BY PROGRAM IMPROVEMENT STAGES	13
	R&D Program Improvement Stages	14
	R&D Impact Criteria	18
III.	DISCUSSION OF R&D IMPACT CRITERIA	25
	Systematic Development	26
	High Quality	29
	User Orientation	32
	Strategic Dissemination	35
	Multiple Channels	37
	Widespread Dissemination	40
	Selective Implementation	43
	Support Systems	46
	Cost Feasibility	49
	Multiple Patterns of Use	52
	Time on Task	54
	Integrated Utilization	57
	User Satisfaction	59
	Individual Growth	61
	Organizational Change	64
	Societal Contributions	67
IV.	APPLICATION AND USE OF CRITERIA	69
	R&D Program Improvement Stages	69
	Assessing Impact	73
	Summary	77

Page

APPENDIX A. USER SURVEY OF INNOVATION IMPACT 81

APPENDIX B. INTERVIEW GUIDE FOR INNOVATION IMPACT 91

REFERENCES 97

LIST OF FIGURES

		Page
Figure 1.	Relationship Between Formative and Summative Impact	3
Figure 2.	R&D Program Improvement Stages	15
Figure 3.	R&D Impact Criteria	19
Figure 4.	Sample Approaches for Assessing Impact during the R&D Process	74

FOREWORD

The impact of research and development on vocational education programs is an important and pervasive topic. Research administrators need to know the impact of R&D both for accountability and for program planning purposes. This report contains criteria for determining the impact of research and development. Both formative and summative impact criteria are proposed for assessing potential and actual impact. The criteria are based on impact studies of twenty-eight products conducted by the National Center for Research in Vocational Education and a review of the literature. Salient features of each criterion are illustrated with excerpts from one or more of the impact studies. Guidelines and caveats are noted for each of the sixteen criteria. Criteria were classified by five R&D program improvement stages. Approaches to assessing impact are suggested.

Appreciation is extended to the reviewers of this report, Thomas Owens, Northwest Regional Educational Laboratory; Peter Seidman, Illinois State Board of Education; Wesley Budke; National Center for Research in Vocational Education; Floyd McKinney, National Center for Research in Vocational Education; and N.L. McCaslin; National Center for Research in Vocational Education. A special note of thanks goes to the authors, Kay Adams, Debra Bragg, and William Hull, for their development of criteria for systematic assessment of impact. Recognition is due to Constance Faddis and Sharon L. Fain for editing and to Jeani Gray for typing this report.

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in Vocational Education

EXECUTIVE SUMMARY

Since 1970, the vocational education community has spent over $350 million to conduct research and development (R&D). In light of such an investment, research administrators need to know not only what changes can be attributed to the use of R&D products, but also the characteristics of successful R&D.

This report was written to help research administrators and evaluators increase the impact of R&D on vocational education programs. By identifying criteria for successful innovations, vocational educators can become more systematic in assuring that R&D innovations make a difference.

Sixteen R&D impact criteria are discussed in this report. The criteria were derived from three data bases. The central data base was impact studies of twenty-eight selected state-developed and National Center products. These impact studies were conducted by the National Center for Research in Vocational Education between 1978 and 1982; both qualitative and quantitative data were collected. The second data base was a computerized ERIC search of 267 impact studies of educational innovations. The third data base was seminal theoretical works and research studies from the innovation diffusion literature. After tentative criteria were identified, they were reviewed by participants in the Fifth Nationwide Vocational Education Dissemination and Utilization Conference, and revised.

Each criterion is classified within one of five R&D program improvement stages. The stages are development, dissemination, implementation, utilization, and effects. These stages are viewed as basically linear although in practice work flows in a cyclical direction between the stages. Most models for assessing R&D impact focus only on the last stage, effects. However the "impact potential" of an innovation is determined by activities in the earlier stages. Consequently this report discusses both formative and summative impact criteria. These criteria should be met by an innovation as it flows through each of the R&D-based program improvement stages. Impact potential of a product accrues at the formative stages. Summative impact is the actual effects of an innovation on individuals, organizations, and society.

Impact criteria are defined for each stage, and salient features of each criterion are illustrated by a case example from an impact study. Guidelines and caveats for using each criterion are recommended. A brief statement on each stage, with each criterion underlined, follows:

- Development — Impact begins with the development of a <u>high quality</u> product. Involvement of relevant audiences should be used to construct a

user-oriented product. A systematically developed product should be research based, tested, and revised.

- **Dissemination** — Strategic dissemination to encourage the spread of the R&D product to primary audiences is essential. Normally, multiple communication channels are used to increase the likelihood of widespread dissemination.

- **Implementation** — A prerequisite for impact is selective implementation. Psychological, administrative, and physical support systems are necessary to make an innovation operational. Cost feasibility studies are helpful in deciding how much the innovation will cost to implement.

- **Utilization** — Integrated use results in integrating a product into personal and organizational routines. Impact measures should allow for multiple patterns of use, some of which may be unanticipated. Time on task in using the innovation enhances impact.

- **Effects** — User satisfaction is a prerequisite to other effects. Product use should result in individual growth, organizational change, and societal contributions.

Improving vocational education with R&D products should be a systematic, incremental process. Impact potential can be built into R&D products if specific criteria and guidelines are met throughout the R&D process. This report should help research administrators, project directors and evaluators gain increased impact from limited R&D dollars.

CHAPTER I

INTRODUCTION

The use of scientific evidence to improve programs has been part of the vocational education system since its beginning. Funds authorized for program improvement in the Vocational Education Act of 1963 and the Vocational Education Amendments of 1976 have resulted in numerous research and development (R&D) projects. Since 1970, sustained funding of vocational education R&D has resulted in over $350 million in expenditures (Hull 1980). Budke (1982) reports that between 1978-82 nearly $105 million were spent by states on nearly 4,000 program improvement projects. These projects have produced research findings, products, and training used to upgrade the knowledge, attitudes, and skills of both vocational educators and students. Through these efforts, a technology of how to conduct research, disseminate products, and use them to improve people and programs has gradually evolved. This technology has not always worked well. Because of the lack of coordination between the efforts, a mediocre idea is often used extensively while one with potential for significant improvement may be overlooked. The persons most likely to use the R&D impact criteria discussed in this report are research administrators, evaluators and others concerned with the use of R&D products to improve vocational education programs. Project directors can also use these criteria to monitor development and dissemination activities.

There are several terms used in this report that need definition. Chief among them is impact. Impact is defined as a measurable change resulting from an innovation. An innovation can effect actual change through its use, and it can acquire the potential for change by meeting specific criteria. Potential for change is an important dimension of impact assessment because it is often impractical to wait until after an innovation has been completed to assess impact. Funding sources, commitment to the innovation, and the need for data are much stronger during the formative stages of the R&D process. Consequently, this report discusses both formative and summative impact. Formative impact can be measured by performance standards that an innovation should meet at each formative stage of the R&D program improvement process--develoment, dissemination, implementation, and use. Summative impact is the actual effects of an innovation on individuals, organizations, and society. Figure 1 illustrates the relationship between formative and summative impact. As shown in the figure, some actual impact can occur during formative R&D program improvement stages.

An innovation is defined as an idea that is perceived by an adopting unit as a new one. Innovation is used synonomously with R&D product in the context of this report. An R&D product may be a research report, an instructional guide, a training workshop, or technical assistance provided by an R&D specialist at the request of a practicing educator.

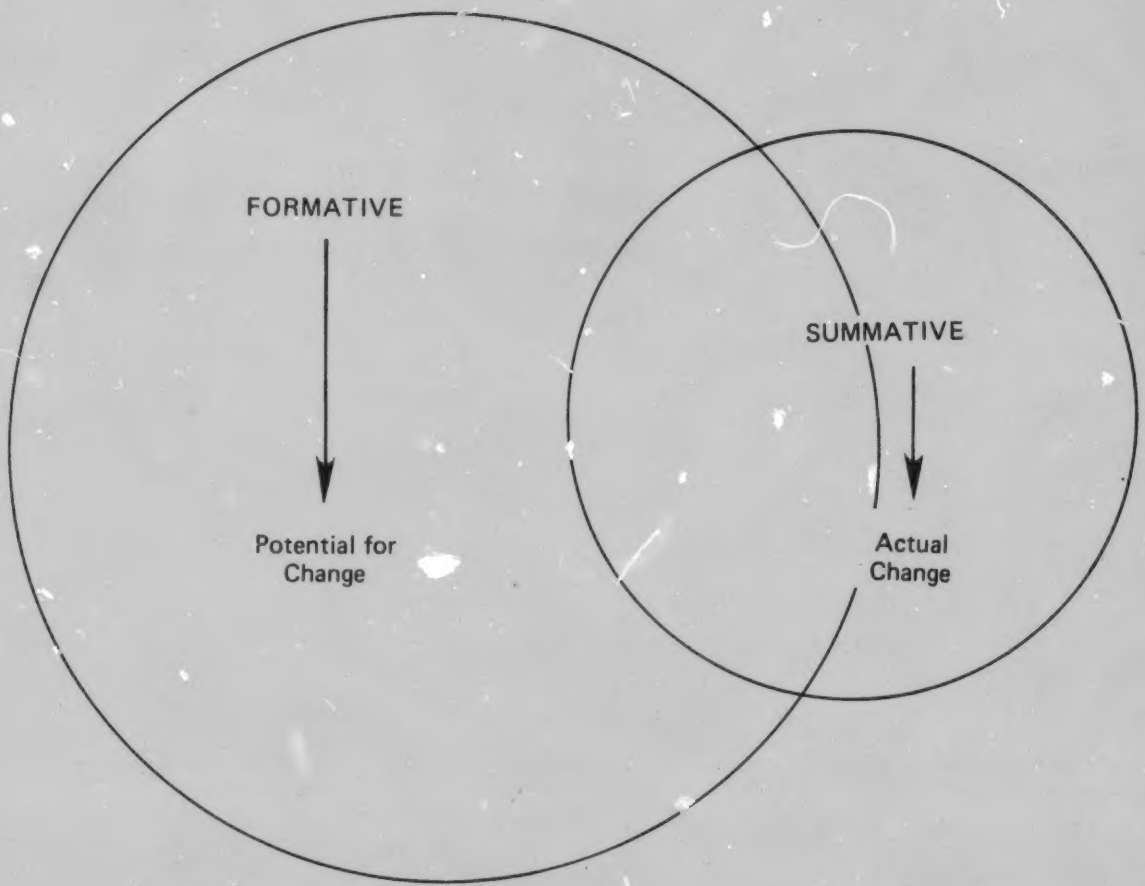

Figure 1. RELATIONSHIP BETWEEN FORMATIVE AND SUMMATIVE IMPACT

Other terms used in this report are defined as follows:

Adopting unit--An individual or group of individuals who use an innovation.

Primary user--The person or persons for whom the product was developed.

Secondary user--A person or persons who use the product as a direct result of the primary user's influence.

Purpose of Objectives

The purpose of this report is to expand the reader's concept of impact stemming from the development and use of research-based products. It encompasses not only the usual concept of impact (as an effect of using products), but also includes preconditions to the development of impact for research and development activities. Additionally, formative impact may occur during the earlier stages of the R&D program improvement process. Examples of "how an R&D product may make things different" in each stage of the program improvement process are illustrated below using the results of the Performance-Based Teacher Education (PBTE) modules developed at the National Center for Research in Vocational Education (National Center). These stages are discussed in Chapter II.

Stage	Example of Impact
• Development	Draft versions of PBTE modules were tested in eighteen field sites prior to 1977. Undoubtedly, the teachers and students using these modules were affected either positively or negatively as a result of this use even before the modules were placed on the market.

- Dissemination — Over 260,000 modules were disseminated between March 1977 and January 1980. Recipients' awareness of the modules was changed as a result of this activity.
- Implementation — Temple University professors allowed students to use the PBTE modules in any sequence and at their own pace, thereby altering the usual structure of this institution's teacher education course work.
- Utilization — The completion of forty-five PBTE modules was substituted for thirty-six credits in the teacher certification program at the University of Central Florida, displacing other courses in teacher preparation.
- Effects — Reports from faculty, staff, and students indicated the time required to certify teachers had been shortened.

Such changes as a result of P&D are unique to a particular stage of improvement in that there is no guarantee that the impact from one stage would be passed on to the next. However, product users during an early stage of development often become advocates at a later stage. Such additional advocacy undoubtedly increases the impact of a product at the utilization or effects stages.

The following two objectives were used for this report:

1. To select criteria for determining the impact of R&D within each stage of the program improvement process.
2. To illustrate salient features of each criterion with representative cases from impact studies.

Impact data, either formative or summative, can be used either for accountability or for planning future R&D interventions. In a sense, impact data can become needs-sensing data for future programs. This contribution of impact data to planning and policy formulation is quite different from the accountability motivation that often drives impact.

Methodology

Several procedures were used to identify the impact criteria. First, three data bases for deriving impact criteria were established. The central data base included impact studies of twenty-eight selected R&D products conducted by the National Center between 1978 and 1982. The second data base was a computerized search of impact studies in the Educational Resources Information Center (ERIC). Two hundred sixty-seven studies were identified in this data base, many of them follow-ups of research-based products. The third data base included selected works from R&D product diffusion literature. After this literature was examined for significant impact criteria, a list of twenty-eight criteria were identified. The criteria were classified by stages in the program improvement process. These criteria were then revised by project staff, by participants in the Fifth Nationwide Vocational Education Dissemination and Utilization Conference, and finally by draft report reviewers. Sixteen R&D impact criteria resulted.

Excerpts were selected from the impact studies of vocational education R&D products and programs conducted by the National Center between 1978 and 1982. Eight of these were state-developed program improvement products and twenty were National Center products and programs. These studies examined impact as well as analyzed factors which contributed to impact. In most cases, the data were collected on site through interviews, observation, and reviews of records. Additionally, mail surveys were used to assess the distribution, use, and impact of the

state-developed products. Several of the National Center products were studied through telephone interviews with recipients; these studies provided cumulative evidence of impact from different types of R&D-based innovations.

Limitations of the Report

1. The language and concepts used to portray impact are linked to the R&D process. All of the studies used to illustrate the impact criteria were based on utilization of R&D products. This limits interpretation and implications from these findings to research-based program improvements.

2. A "product" mentality pervades these criteria. This was not deliberate; it was merely convenient. Transportability of R&D results is enhanced by packaging the innovative finding or procedure in a way that is acceptable to others. However, the reader should keep in mind that most R&D generates many effects (such as a changed attitude in people who are associated with it) that cannot be packaged into a product; they must be experienced. Because of this, training workshops and technical assistance efforts are considered R&D products.

Toward a Conceptual Framework of R&D Impact

Current limitations in R&D funds place pressure on researchers to ensure program improvement. Accountability has become a major concern for both researchers and program managers. With this in mind, the authors have examined the program improvement literature for ways to enhance impact.

Three bodies of knowledge provide guidance for identifying the critical ingredients of R&D impact. These are (1) theory and models that define innovation diffusion and knowledge utilization, (2) large-scale empirical studies of the change process, and (3) evaluations of vocational education R&D efforts that appear to have had impact. A brief description of each of these knowledge bases follows.

Theory & Models

Conceptual frameworks for describing the processes of innovation diffusion and knowledge utilization have abounded in the literature. Rogers (1962) described a five-stage adoption process that involved carefully guided movement from initial awareness, interest, evaluation, and trial to final adoption of an innovation. Rogers included descriptions of innovation characteristics, environmental facilitators and inhibitors, and categories of adopters in his diffusion model.

Havelock (1971) added the personal linkage perspective. He emphasized the importance of interpersonal linkages among researchers and practitioners in problem identification and solution. Kotler (1972) built a repertoire of change strategies to be used in diffusing innovations. Chin and Benne (1969) described three categories of strategies: coercive, persuasive, and reeducative. Zaltman and Duncan (1977) expanded the realm of possible change strategies to include an array of tactics from direct mail to network building. The Dissemination Analysis Group (1977) reorganized Roger's model into four levels: spread,

exchange, choice, and implementation. Hall and Loucks (1977) added the concept of "levels of use" of innovations from routine use to renewal. Sieber (1968) expanded the list of environmental situations that affect innovations by considering factors such as resistance to innovation and goal conflicts. Later, Sieber (1981) added conceptual guidelines for incentives and disincentives to knowledge utilization. Louis, Rosenblum, and Molitor (1981) defined characteristics of external agents that facilitate knowledge utilization. Most recently, the concept of "system linkage" has been emphasized in diffusion literature. Weick (1976) introduced the concept of "loose-coupling" or the establishment of informal, voluntary, and often nonrational linkages within and among organizations. The diffusion literature base provides conceptual frameworks for identifying facilitators and inhibitors of R&D impact.

Within vocational education, the National Center has conducted numerous studies that apply diffusion literature. One of the most widely adopted was Innovations Evaluation: A Consumer's Guide (Hull 1971). The National Center (1979) also developed Tentative Product Selection Criteria for the National Dissemination and Utilization System for Vocational Education. The tentative product selection criteria in this publication were organized into five categories: effectiveness, compatability, content, cost-efficiency, and research evidence of effectiveness. The Illinois State Board of Education (1980) has developed detailed guidelines for dissemination and assessing impact of vocational education program improvement products.

Empirical Studies

Several large-scale studies have been conducted to determine why research and development products do or do not have impact. Berman and McLaughlin (1978) studied four federal change programs including the Exemplary Programs mandated in the 1968 Amendments of the Vocational Education Act. A key finding from this study was the two-fold process of adapting innovations. In this process, both the product and setting were changed by implementation activities. In 1977, Abt Associates in Cambridge, Massachusetts, began a study of a three-year experiment in the delivery of research-based products for school improvement (Louis et al. 1982). The study found participation by the entire staff in a problem-solving process to be important. There was no relationship found between the costs for school improvement efforts and the chances of success.

A massive study of dissemination efforts that support school improvement was undertaken by the NETWORK in 1978 (Crandall et al. 1982). The primary finding was that the major factor producing change in classroom practice was the amount of classroom time spent on the new practice. Time on task appears to be an important variable in producing teacher commitment. Clearly, progress in understanding impact is being made, but much remains to be done in its measurement.

Recent refinements of knowledge utilization concepts through empirical studies have emphasized linkage, networking, and loose-coupling. Adoption of innovations is now viewed as a more diffuse, interactive, and adaptive process then it was in the

early 1960s. Thus mutual adaption rather than adoption may better characterize the utilization of new knowledge.

Evaluations of Vocational Education R&D

Within vocational education, three large scale studies of R&D have been conducted: (1) The Committee of Vocational Education Research and Development (COVERD 1976) assessed R&D conducted between 1965 and 1974, (2) Development Associates (1975) studied career education projects, and (3) the General Accounting Office (1974) studied vocational programs funded under the Vocational Act of 1963. These studies found little evidence of R&D impact on students. After an analysis of these studies, Kim (1982) recommends additional theoretical research, empirical studies of the funding process, and the development of comprehensive frameworks for impact studies.

CHAPTER II

R&D IMPACT CRITERIA BY PROGRAM IMPROVEMENT STAGES

Changes resulting from the use of R&D products may be pervasive, may be short or long term, and may be difficult to detect. The procedure for impact assessment should be carefully developed for each program or product. Time is required for impact to take place, so it is helpful to identify indicators of impact for each different stage in the R&D program improvement process.

This chapter contains sixteen indicators of impact in the form of criteria classified according to the five stages in the program improvement process. Evaluative information from impact studies in itself does not assure program improvement. In fact, it may indicate very little improvement has taken place. However, a comparison of observations against the criteria proposed in this report does provide a basis for estimating the likelihood of impact from an R&D product. For example, a product disseminated to only one county in a state is likely to have less impact (other factors being equal) than a similar product disseminated throughout a state. In most cases, of course, resources are limited; thus the same number of products spread throughout the state would have to be more strategically disseminated than one which is concentrated in a single county.

The impact criteria in this report are based on five years of studies at the National Center and a review of related literature. The criteria are applicable to research,

development, and training projects. They are listed in this chapter for easy review by the reader, and are preceded by a conceptual framework to help explain the R&D program improvement process on which they are based. The impact criteria are grouped by stages in this framework. Each of the five stages in the framework are explained prior to defining the criteria.

R&D Program Improvement Stages

The framework in figure 2 places the five stages of program improvement in a linear sequence. The framework depicts one of several existing models of the program improvement process. The chosen framework is logical and illustrative of the flow of product development to program improvement. However a linear sequence can be criticized for not recognizing the cyclical flow of work usually associated with R&D processes. For example, products may be significantly redesigned during the implementation stage. Additionally, a linear model does not depict interactive linkages between users and researchers. Recognition of the importance of viewing program improvement as an interactive and cyclical process is represented by the dotted feedback lines in the figure. The chosen framework, although somewhat static and lock-step in appearance, provides a convenient and logical frame of reference for identifying impact criteria. Each of the stages depicted in figure 2 are discussed in the following section.

The first stage of the process for improving programs is development. The term development refers to the span of the R&D

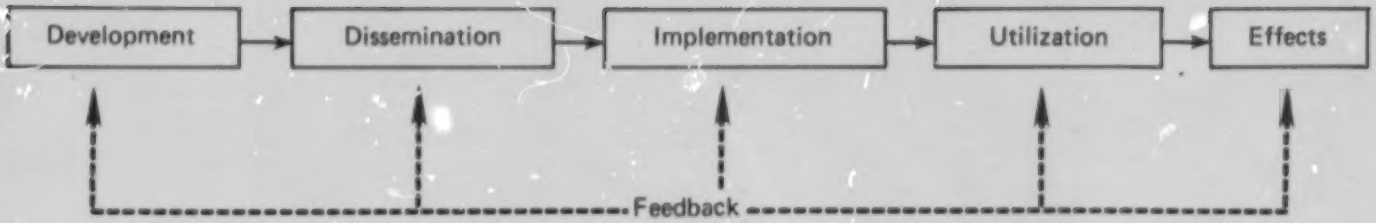

Figure 2. R&D PROGRAM IMPROVEMENT STAGES

process from basic research to a completed, tested product or program. This may occur on site, in a local education agency (LEA), or may take place some distance from local instructional activities. R&D funds are used by local education agencies state departments, universities, and centers or regional laboratories to devise new and better educational innovations. The concentration of expertise in development at these locations may be efficient, but barriers to acceptance of the new ideas are created by both physical distance and by users' lack of ownership. Thus, it is critical that the innovation be relevant to the needs of the potential adoption site. This is why the next stage of program improvement is so important.

Dissemination must be considered in improvement plans even if the innovation is developed at a local site such as a school district. An innovation should be transported to other locations to keep money from being wasted by others "rediscovering the wheel." Agencies that sponsor an innovative development often must take on the responsibility of spreading it to other sites. A local school has few incentives to disseminate new ideas outside of its own district. Dissemination costs for exemplary programs/products may be borne by national organizations such as the National Diffusion Network (NDN) or state agencies such as a research coordinating unit. (These organizations are interested in nationwide and statewide program improvement, respectively.) Normally, these agencies provide information about the exemplary program and, on occasion, fund sites to demonstrate the program. Dissemination is clearly an important stage in the program

improvement process. People learn of innovations from their friends, printed information, conferences, etc.

Implementation bridges the gap between learning about the innovation and actually trying it. Rogers (1962) talked about the trial use of an innovation. His discussion is relevant if the adopter is an individual. However, the process of incorporating an innovation into an organization is quite a bit more complex. Various parts of an organization must be assessed and analyzed to determine the effect of the new idea on them.

Groups of people often must be consulted and disruption minimized in order to encourage the next stage of R&D-based program improvement, utilization. Actual use of an innovation must precede any claims of effects. Use varies from partial to complete, and from anticipated to unanticipated. Sometimes the product or program is discontinued soon after adoption or is modified as it is used at the new site. Unique adaptations of an innovation on site can lead to creative, integrated, beneficial uses. However, commensurate with these adaptations should be adjustments in the expectations for what the modified innovation can achieve.

The final stage of program improvement is effects. Measuring the effects of an R&D innovation constitutes a search for visible changes as a result of its use. Attributing causality to an innovation is extremely difficult because conditions that affect program outcomes are many and interrelationships among variables are complex. Nevertheless, an impact evaluator must

sort out the factors that influence program effects and describe them as completely as the data will permit.

R&D Impact Criteria

Criteria for assessing the impact of R&D products are arrayed along five stages in figure 3. Two different types of impact criteria are presented: formative and summative. Criteria inherent in the first four stages in the framework (development, dissemination, implementation, and utilization) are considered to be formative impact criteria. The primary purpose of evaluations conducted during these stages is to enhance the impact potential of the innovation. Criteria related to the last stage, effects, are considered summative criteria. Changes in people, organizations or society are primary indicators of summative impact. Evidence on the permanence of the changes and unanticipated consequences of the innovation sometimes occur months or even years after the innovation has been introduced.

Securing the funds, time, and interest for conducting impact assessments is difficult. Consequently, the authors advocate formative impact assessments as well as summative impact assessments. Formative impact assessments would examine the extent to which important criteria have been met at each stage of the R&D process. The effect of an R&D product in meeting these criteria is cumulative. For example, a product that is systematically developed, strategically disseminated, selectively implemented, and used in an integrated manner is likely to result in greater change than is a product not meeting these criteria.

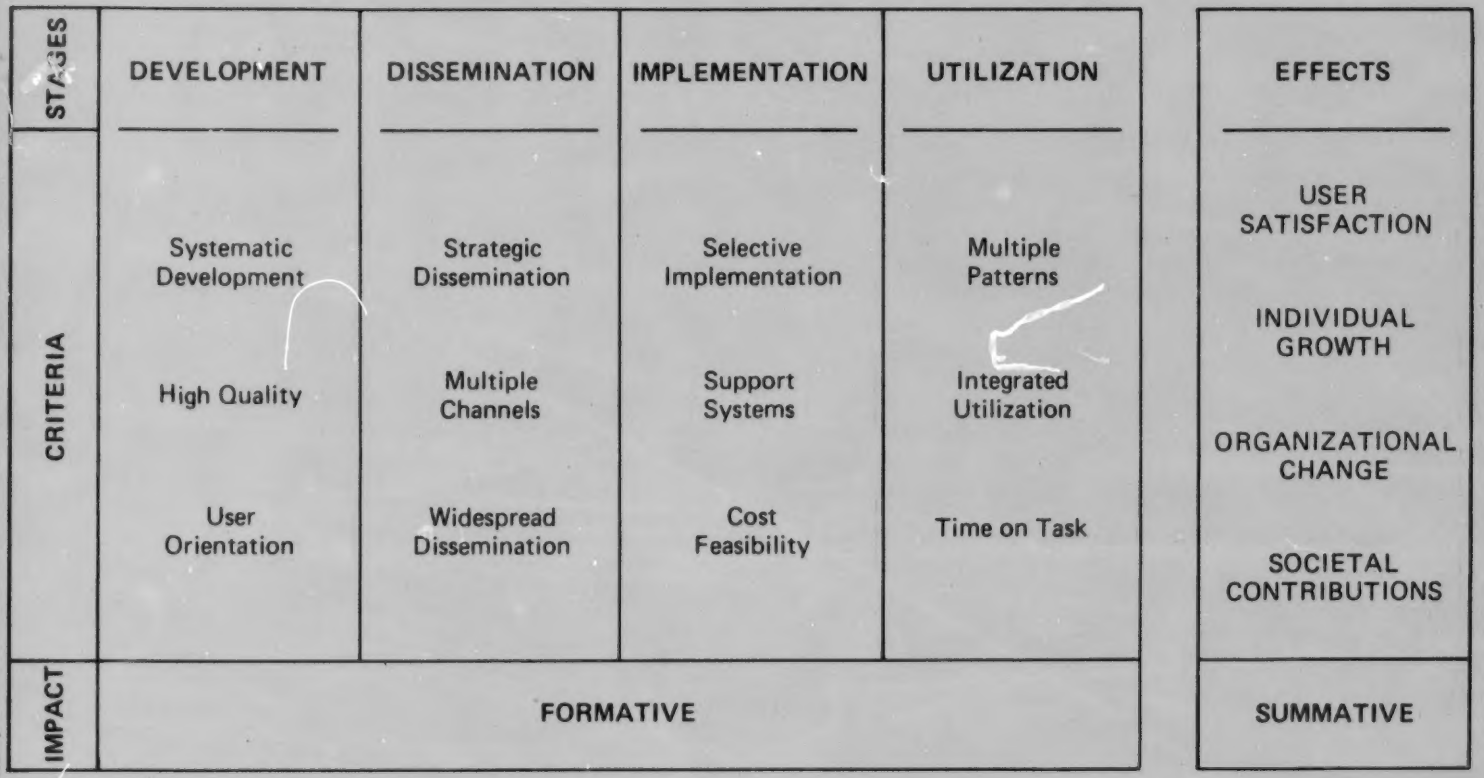

Figure 3. R&D Impact Criteria

Of course, the impact of an R&D product also reflects the constraints and opportunities present in the adopting unit's environment. Thus a product developer or disseminator does not have total control over changes that may or may not take place. Definitions of sixteen R&D impact criteria organized by the five program improvement stages follow.

Development

Impact begins with development of the product. Thus criteria used in the development process can subsequently be used to select relevant research for developing other products, to encourage systematic testing/revision, and to upgrade product quality.

Systematic development. A systematic process should be followed in developing innovations. An ideal process would include conducting research/needs assessment/task analysis; reviewing relevant knowledge/practice; building a conceptual framework; sequencing development; conducting testing and revision cycles; disseminating the product; implementing the product; and evaluating the results.

High quality. Innovations should reflect scholarship, be useful, communicate clearly, be marketable, and be free of biases. Content should be accurate, up-to-date, focused on essentials, and complete.

User orientation. Representatives of relevant audiences should be identified and involved in designing, testing, and using innovations. Primary audiences should receive priority in

dissemination efforts. The resulting product should contain practical information organized in an easy-to-use format.

Dissemination

The dissemination criteria should encourage the spread of the R&D product to primary audiences, increase the likelihood of the product's acceptance, and generate support for its use.

Strategic dissemination. Cost-effective strategies for disseminating an R&D product should be devised based on characteristics of potential users; site-specific factors; and features of the product itself. Dissemination should be strategic in reaching opinion leaders and influential organizations in the external environment.

Multiple channels. More than one channel for conveying information about innovations should be used. Communication should include mass media (e.g., direct mailing of brochures) and interpersonal channels (e.g. technical assistance). Normally, information duplication and overlap are assets rather than liabilities during the dissemination stage.

Widespread dissemination. Innovations should reach as many potential users as possible. Thus dissemination to individuals in different roles, in diverse settings and in many geographic areas should be emphasized. Secondary dissemination through workshops, reprints, libraries, the ERIC system, and so on should be encouraged.

Implementation

Implementation strategy determines the product's point of entry into an organization (e.g., at the classroom level). Cost

feasibility studies and the need for support systems, aid the timely implementation of R&D.

Selective implementation. The introduction of innovations should be sequenced to meet the needs and unique characteristics of an adopting site. A process of mutual adaptation between the site and the innovation should be encouraged.

Support systems. Support systems necessary for encouraging the full use of an innovation should be operational at the time of implementation. These systems are of three types: personal resources (e.g., administrative endorsement, site personnel endorsement); information resources (e.g., training in the use of support materials and procedures); and physical resources (e.g., dollars, supplies, and equipment).

Cost feasibility. Information describing the innovation's resource requirements should allow quick and easy estimates of costs likely to be incurred by an adopting unit.

Utilization

Various product use criteria can encourage the appropriate trial use of products, stimulate their integration with existing operations, and increase the chances of their continued use.

Multiple patterns of use. An innovation's use patterns will vary according to the conditions of use received, its intensity, level, frequency, and extent. The users' setting, role, and demographic characteristics create the conditions for different types of use. Multiple patterns of use and secondary use of R&D by other than the primary user audience should be encouraged.

Time on task. An R&D product should be used frequently enough and long enough for its use to become an integral part of current practice. The audience's time in actually using the product should be maximized.

Integrated use. The use of an innovative product should be intensive and pervasive throughout the organization. Accomplishing this task will require drawing on personal commitment within the organization to institutionalize the product into organizational routines.

Effects

Product effects criteria should accurately describe changes in individuals, organizations, or society attributed to use of R&D innovations.

User satisfaction. The R&D product and its implementation should meet users' expectations and result in a positive user attitude toward the product. User satisfaction may be indicated by product advocacy and/or creative adaptions.

Individual growth. Innovations should contribute to changes in an individual's attitude, knowledge, and/or performance.

Organizational change. R&D products should contribute to beneficial changes in the user's organizational policy, programs, practices and/or structure. Furthermore, these changes may reflect cost and time savings over current practice.

Societal contributions. R&D products should contribute new and significant information with the potential to advance knowledge, improve current practice, and/or influence social systems.

CHAPTER III

DISCUSSION OF R&D IMPACT CRITERIA

This chapter describes each impact criterion in greater detail. For each criterion, the following sections are provided:

- Definition
- Overview
- Illustrative Case(s)
- Guidelines
- Caveats

The definitions for each step in the systematic implementation process as indicated in Chapter II is repeated, and then expanded through an overview of the related research and component parts of each criterion. Each criterion is illustrated with one or more examples from actual vocational education innovations. These illustrative cases are excerpts from impact studies of eight state-developed products and twenty products and programs produced by the National Center between 1978 and 1982. Guidelines for using the criteria and for utilizing the caveats on problems that may occur are then presented. The guidelines are intended to help the reader implement the criteria in their particular situation. Guidelines for the effects stage criteria tend to focus on assessing impact. The effects criteria, unlike the criteria in the previous four stages, indicate summative impact. The caveats identify some of the pitfalls to avoid in meeting each criterion.

A systematic process should be followed in developing innovations. An ideal process would include conducting research/nee's assessment/task analysis; reviewing relevant knowledge/practice; building a conceptual framework; sequencing development; conducting testing and revision cycles; disseminating the product; implementing the product; and evaluating the results.

Overview

Many models exist for systematic change. Guba and Clark's (1965) Research, Development, Diffusion, and Adoption model was one of the first calling for programmatic activities. Later, a fifth phase (evaluation) was added to this model. Stufflebeam's, et al. (1973) CIPP model--Context, Input, Process, Product--focused primarily on evaluation as it relates to each phase of program development. Rosenberg's (1982) Instructional Systems Design (ISD) model includes the phases of analysis, design, development, implementation, and evaluation.

Most models calling for systematic development use a linear process. Typically, these models incorporate both evaluative feedback and the recyling of feedback, but they basically move in a sequential, somewhat lock-step manner from point A to point B. Other authors have developed linkage models that emphasize interactive user involvement throughout the research and development process. Havelock and Lindquist (1980) place users in the center of the linkage model by moving them through the stages of identifying and solving user problems. These stages are (1) arousal and articulation, (2) communication, (3) implementation, (4) scientific problem-solving, (5) transformation, (6) dissemination, (7) utilization, and (8) user problem solving.

Ideally, the R&D process should be based on scientific knowledge and processes as well as on practice. User's ideas, input, feedback, and experiences should be systematically incorporated at critical points in the R&D process.

Illustrative Case

The case of the National Center's Performance-Based Teacher Education (PBTE), a vocational education curriculum, series (Hamilton et al. 1977) provides an example of systematically developed R&D (Adams, MacKay and Patton 1981). This

curriculum was developed over a ten-year period. PBTE was extensively researched, fully tested, and carefully written. Work on PBTE began at The National Center in 1967 with a research study to determine important competencies for vocational-technical teachers (Cotrell, Chase, and Molnar 1972). Following identification and verification of 384 competencies, modules were developed. These 100 modules, covering the essentials of teaching, formed the core of PBTE. Throughout the modules' development, emphasis was given to continuous refinement through iterative cycles of development, testing, and revision. Supporting materials were also developed. In summary, the development of PBTE included basic research from 1971 to 1974; field testing from 1975 to 1976; training personnel for implementation from 1976 to 1978; and dissemination and utilization from 1977 to the present.

Guidelines

- Conduct a needs assessment to ensure a focus on an enduring problem without neglecting immediate needs.
- Review relevant research and practice to ensure that the product builds on prior work, is nonduplicative, and makes a contribution to knowledge.
- Base design of the product on appropriate theories, conceptual frameworks, input from potential users, and practices that work.
- Develop the product through systematic steps.
- Test and revise the product in phases (e.g., pilot testing, field testing, expert review, and user review).
- Plan for widespread dissemination of the results through multiple channels.
- Provide for assistance to users during the implementation stage.
- Evaluate the product to assess user satisfaction and its effects on individuals, organizations, and society.

Caveats

- The push-pull between scientific precision and pragmatic consideration must be carefully balanced. At times, systematically conducted R&D must be approximated during certain steps.

- Useful substitutes for standard R&D procedures include a user panel instead of a needs assessment, an expert consultant or panel instead of a literature review, and reviewers instead of testing. These substitutes, used effectively, can result in high-quality products that meet the needs of recipients.

- If one takes too many shortcuts in the scientific process or moves too far toward user-oriented concerns, R&D that merely reinforces conventional wisdom may result. This would not advance knowledge. Instead it would waste valuable resources.

Innovations should reflect scholarship; usefulness; communicability; marketability; and equity. Content should be accurate, up to date, focused on essentials, and complete.

Overview

Quality, always somewhat in the eye of the beholder, is a nebulous yet essential ingredient. Scholarship may be less important to some groups than others. Individuals with different values, biases, and preferences will have different quality standards. Yet quality is an essential ingredient for all innovations.

A product of high quality will tend to be used over time and have deeper effects than one of lesser quality. The Education Products Information Exchange (Komaski 1978) compiled a synthesis of minimum quality criteria for educational products. These criteria are especially useful for instructional materials. Krause and Adams (1982) also developed criteria for ensuring quality in research and knowledge products based on five categories of criteria: (1) scholarship, (2) usefulness, (3) equity, (4) communicability, and (5) marketability. Specific criteria and standards for each of these dimensions of quality need to be defined.

Illustrative Case

One of the most sought after products distributed by the Dissemination and Utilization Program at the National Center was the Handbook for Teachers of Adult Occupational Education. This easy-to-read and informative digest on adult education teaching methods was developed by the Bureau of Occupational Education Curriculum Development of the New York State Education Department (1977). The handbook assisted individuals in becoming competent instructors in their field. It also answers some of the questions new instructors have during their first few weeks of teaching. The content include information about students, principles of teaching, testing and evaluation of students, curriculum developoment, planning for instruction, and classroom management.

The handbook was practical, straightforward, and oriented to adult teachers. It was not an in-depth treatment of teaching

methods. Features of the product that appealed to users were the following:

- Adaptable, easy-to-use format. Instructors could find the information they needed and read the sections in a few minutes. The illustrations lent themselves to a wide variety of settings.

- Highly focused content. The information was designed for first-time teachers of adults and/or instructors of occupational programs. The information was relevant to their needs and perceived by some as sufficient for new instructors.

- Unbiased material. No sex or social biases were found in the material.

- Attractive layout. The booklet was very readable and packaged with illustrations.

Many factors account for this product's high level of use. In addition to the high-quality content, the booklet met a pervasive, critical need: the upgrading of skilled craftsmen into competent instructors. A support system was already in place (e.g., the teacher education staff in colleges and universities) to promote the product. Today, the product is being used as a primary teacher training resource by a network of community colleges in South Dakota. CETA program instructors, local education agency in-service programs, postsecondary teacher training programs, teacher certification programs, and private trade schools are also are using the product.

Guidelines

- Ensure the content is accurate, up-to-date, systematically researched/developed, focused on essential subject matter, and complete in its references.

- Present the information in a format that is practical, relevant to user needs, complete, adaptable to different settings/audiences, and capable of extended utility.

- Use language that encompasses both sexes, avoids stereotypes, and represents different special need groups through examples.

- Be sure the materials have a logical flow of ideas, a consistent format, an overview and/or synthesis, grammatically correct language, and an interesting writing style.

- Be sure the publication has an appealing title, an attractive layout, a reasonable length, and a professional appearance.

Caveats

- Quality may be sacrificed when the state-of-the art is underdeveloped and the need is great. Real trade-offs can occur in development of high-quality products when resources are limited. The developer must balance the use of resources during the development with later dissemination/implementation costs.

- Quality can only be judged in relation to what is possible at the time. Results of the needs assessment should be used to prioritize what is most important to ensure that minimum standards of quality are met.

Representatives of relevant audiences should be identified and involved in designing, testing, and using innovations. Primary audiences should receive priority in dissemination. The resulting product should contain practical information organized in an easy-to-use format.

Overview

This criterion emphasizes the importance of conducting R&D with, by, and for intended users. User orientation should consider both group and individual dimensions. Products that have been identified as being "relevant" and "easy to use" have been readily adopted in schools. Hood and Blackwell (1976) found an emphasis on interactive information gathering from local sources to be very important. Teachers and principals were more likely to use a product when they found it "likely to have the information they want" (Sieber 1981). To be effective for primary users, R&D products should contain practical information organized into a useful format. Conceptual materials require additional time for teachers to use in classroom activities. In contrast, instructional materials designed for direct, independent use by students are easy for teachers to implement. Conceptual materials may be more appropriate for researchers, administrators, and policymakers.

Illustrative Case

An example of how materials evolve from teaching guides to individualized student modules was the Vocational Education Special Education Project (VESEP) in Michigan (Central Michigan University, 1974 and 1978). Almost one million dollars was spent in three phases of product development. Ten instructional guides evolved from the first phase, supplemental materials were designed during phase two, and finally, in phase three, competency-based modules were developed for use by students in the classroom. When administrators, teachers, and students were interviewed during an impact evaluation of the Vocational Education Special Education Project (Bragg and Hull 1981), positive impact was usually found to have resulted from the use of the student modules. A comparison of the format of these materials indicated the more student-oriented the product became, the more useful they were for teachers. The materials from the first phase were conceptual in nature, requiring the teacher to further develop instruction for students. The materials from the last phase, however, were ready to use. The teacher had only to assign them to students in an appropriate manner and grade the competency that each student achieved.

The teachers' experience in using the VESEP materials emphasizes the need to know constraints of the primary user audience. Teachers do not have the time to develop materials when assigned to a full classroom schedule. All the VESEP materials were attractively packaged and completed in a professional manner. However, an instructional format was missing from the initial materials', thus these concepts had to be further developed by the teachers. On the other hand, student modules were easy to use. Project developers should keep this in mind as they develop materials for classroom use.

Guidelines

- Identify one primary target audience.
- Identify other relevant audiences.
- Involve representatives of primary and secondary user audiences in designing, refining, and testing the innovation.
- Design innovations with the users' needs, values, and abilities in mind.
- Involve users in dissemination through networks and demonstration sites and by having users train other users.
- Establish guidelines for user involvement e.g., number of reviews, to maintain a balance between usefulness and scholarship.
- Format the product for easy use through mechanisms such as illustrations, lists, advance organizers, summaries, indexes, modularized design, transparency masters, and so on.

Caveats

- User orientation may mean sacrificing quality and higher order concepts in an attempt to appeal to the widest possible audiences. If some users have difficulty understanding the concepts presented, the content may be overly simplified in the interests of making the product oriented to the broadest range of users.
- User orientation may detract from specificity because of attempts to address the needs of divergent users in one product.

- Developers should design a product to meet the needs of a primary group of users; opportunities for broader application should be considered a secondary, not primary, objective.

Cost-effective strategies for disseminating R&D products should be based on characteristics of potential users, site-specific factors, and features of the product itself. Dissemination should be strategic in reaching opinion leaders and influential organizations in the external environment.

Overview

Dissemination of a product should be strategic in relation to three dimensions: individual differences, contextual factors, and the power of marketing. First, potential users have various interests, styles, and abilities. Some individuals are more oriented to live action and oral communication than to printed materials. Some users will be more predisposed toward a product than others. Strategic dissemination considers individual differences and fosters acceptance, ownership, and advocacy of innovations by specific individuals or groups. Second, contextual factors are important. Schools may have more funds to purchase products at particular times. Interest in a topic may be boosted by a public event. Dissemination should be timed to strategically capitalize on contextual opportunities. Third, different emphases in marketing the product will produce different results. In the commercial world, changing one word in an ad can boost sales by 40 percent. What is communicated about a product strongly influences who purchases it and how many are sold.

Illustrative Case

A continuing goal of the National Center has been to assist disadvantaged youth to obtain the skills necessary for employability. One National Center product related to this goal is Bridges to Employment (Winkfield et al. 1980). Many disadvantaged youth are school dropouts and unemployed. Working through public schools would not reach much of this population. Many programs for disadvantaged youth tend to be outside the public schools. In addition, program staff tend to be reluctant to use formal school-like documents with out-of-school youth.

A strategic dissemination plan was devised to address the unique needs of out-of-school youth. A free, two-day workshop was conducted to help Neighborhood Youth Corps staff in Philadelphia to implement Bridges to Employment. All twenty-three workshop participants received a free copy of the printed product.

A follow-up study on the use of this product was interesting (Bragg 1981). Only three of the workshop participants (13 percent) actually used the product after the workshop. However, 80 percent of the participants had implemented ideas from the workshop through presentations and handouts. In other words, the product had been used only sparingly. But probably more importantly, the information from the product had been communicated better orally than in writing. This case illustrates how a target population can be reached through verbal communication rather than printed information.

Guidelines

- Time the introduction of innovations to fit available resources and compliment ongoing activities.
- Collect market information on characteristics of potential users and competing innovations.
- Design different dissemination strategies for different types of users in different types of settings.
- Devise different dissemination strategies for different types of products and information.

Caveats

Strategic dissemination requires precise information about characteristics of the product, potential users, competing products, and related activities. This complex array of information must be juggled when strategic dissemination plans for different users and situations are formed. Collecting such information can be a waste of time if not carefully planned, executed, and used.

More then one channel for conveying information about innovations should be used. Communication should include mass media (e.g., direct mailing of brochures) and interpersonal channels (e.g., technical assistance). Normally information duplication and overlap are an asset rather than a hindrance during the dissemination phase.

Overview

Research on the change process has shown that repeated exposure to a new idea stimulates adoption. Individuals are more likely to purchase a product if they hear about it from several sources. Once a product is purchased, multiple channels of communication can accelerate its adoption by reinforcing use. Roger's (1962) model for the diffusion of innovations was based on five stages: awareness, interest, evaluation, trial, and adoption. Each stage requires a different type of information. Subsequent diffusion models have incorporated two-way communication. The Dissemination Analysis Group (1976) described four stages in their dissemination model: spread, exchange, choice, and implementation. The "exchange" stage incorporates feedback from users, which is an important consideration in the change process. Havelock and Lindquist (1980) build two-way communication into every stage of dissemination.

Illustrative Case

The National Center has studied sex equity since 1966. Since that time, information on sex equity has been shared in numerous forms (e.g., research findings, products, conferences, and technical assistance). Information on sex equity has reached the vocational education community through the following channels:

- A national conference on the educational implications of women's work patterns
- Training conferences for sex equity coordinators
- Research on career patterns of adult women
- Research on career plans of senior high school females
- Survey of women administrators
- Development of a directory of women administrators

- Development of a curriculum package on career options
- Development of a parent handbook on career implications of sex stereotyping
- Development of annotated bibliographies and knowledge synthesis papers on equity issues
- Development of a training package for sex equity coordinators
- Development of a catalog of strategies for recruiting men and women into nontraditional careers
- Development of sex equity training manuals for teachers in various occupational areas

Multiple channels of communication have been used to influence the work of sex equity coordinators located in each state. A survey of sex equity coordinators (Brickell and Paul 1979) revealed the following effects of multiple communication channel dissemination:

- All recipients had read the publications
- Two-thirds had attended conferences
- Two-thirds had consulted with National Center staff
- One-third had visited the National Center

The typical coordinator was familiar with ten different publications. On the average, coordinators had participated in seven separate service activities.

In this illustrative case, multiple communication channels were quite useful in reinforcing use of sex equity resources by state coordinators. The many repeated contacts resulted in incremental improvements in sex equity for vocational education.

Guidelines

- Use mass media dissemination strategies such as direct mail of brochures, conference displays and announcements/ articles to create awareness of and interest in a product.
- Use interpersonal dissemination strategies such as workshops, technical assistance, demonstration sites, linkers, and networks to encourage trial use and adoption of a product.

- Create opportunities for frequent feedback from potential and actual users to facilitate ownership and continued use.

Caveats

Use of multiple communication channels requires access to primary audiences, availability of resources, and follow-up communications. During this process, resources can be spread too thin across multiple channels. In addition, communication channels that take longer to pay off may not receive sufficient attention.

Widespread Dissemination

Innovations should reach as many potential users as possible. Dissemination to individuals in different roles, to diverse settings, and to many geographic areas should be emphasized. Secondary dissemination through workshops, reprints, libraries, ERIC, and so forth should be encouraged.

Overview

There is a tendency to limit dissemination to geographic areas supporting development of the innovation. To minimize "recreating the wheel," products and ideas should be disseminated widely. The more potential users who hear about a product, the greater the likelihood that use will occur. Not only must a primary user audience be "saturated" with a product to stimulate use, but individuals in roles and organizations related to primary use should also be considered potential users. Widespread distribution stimulates diverse uses, as there is more variety in the roles and organizational settings of users. Widespread dissemination increases opportunities for use.

Illustrative Case 1

Some of the most interesting and worthwhile uses of products have come from sources unanticipated by product developers. This was true of the Employability Skills series developed by the Center for Studies in Vocational Education (1977) at Florida State University. This series of six volumes focused on how to keep a job. It was implemented by using a series of workshops in secondary schools throughout Florida in 1977 and 1978. The following findings were somewhat surprising to investigators studying the product's impact (Hull 1981b):

- Students in Adult Learning Centers were using the series to prepare for General Education Diploma (GED) exams.
- The Telephone Industries Program at Seminole Community College was providing the booklets free to students enrolled. The 120 students served per year each received ninety hours of instruction from the books. Interestingly, the College did not reproduce the book on Choosing an Occupation because they believed these students had already selected the occupation in which they wished to be trained.

- Every student completing the associate's degree program at Daytona Beach Community College was required to take a course on successful employment techniques using this product. This included twenty to thirty students in each of five to seven classes each semester.

- The residents of Orange House, a facility of the Florida correctional system, were using the series to learn values. The residents were boys between the ages of fifteen and eighteen who were one step away from a maximum security facility.

In Florida, the range of adaptive product uses was broad. The astute product developers defined the user group in order to include relevant technical skills for persons in different roles and organizations. The dissemination plan specified sending sample copies to these diverse audiences.

Illustrative Case 2

One R&D project at the National Center focused on identifying new and emerging occupations (Orth and Russell 1980). Results from this project were widely disseminated, especially to the general public. Distribution through the press and media created a "snowball effect" in terms of generating interest among the general population. Initially, the Ohio State University faculty newspaper, On Campus, described findings from the project. Then the city newspaper picked up the article and ran the story on the front page. Following this, a local radio station announcer interviewed the project's researchers concerning the results. This coverage alone resulted in making about 125,000 individuals aware of new and emerging occupations identified through the research. However, this probably represented only a small segment of the population who learned of the project's findings, as the results were communicated across the country through broadcasts from radio stations, including stations in Atlanta and Los Angeles. In addition, the findings were published in national publications as well as in other professional journals, including Occupational Outlook Quarterly (Russell 1982).

Results of the new and emerging occupations project were distributed widely due to the amount of interest shown by the general public. Of course, individuals affiliated with vocational education were also interested in the information. Administrators of state and local vocational education programs, employers representing business and industry, and career education counselors found the information most useful. In all cases, dissemination of the results increased individuals' awareness of new and emerging occupations.

Guidelines

- Give the primary audience priority in dissemination. Reach as many members of this audience as possible.
- Disseminate the product to diverse roles within organizations.
- Disseminate the product to various types of organizational settings.
- Disseminate the product to many geographic areas.

Caveats

- Be careful to explain any special requirements when using the product in order for it to be optimally effective under a variety of different conditions.
- Widespread dissemination should not be sought at the expense of other impact criteria (e.g., strategic dissemination).

The introduction of innovations should be sequenced to meet the needs and unique characteristics of an adopting site. A process of mutual adaptation between the site and the innovation should be encouraged.

Overview

Louis et al., (1981), in the Abt Study of R&D-based products, found that the fit between a product and a local site was even more important than product quality. If schools carefully define their local needs and find a product that fits those needs, implementation can occur without adapting the product.

Whether or not a product fits a particular site depends on the following factors: (1) site needs, (2) context, (3) socio-political values, (4) resource base, (5) timing, and (6) compatability with ongoing activities.

Illustrative Case One

In 1978, the Milwaukee School System was invited to field test some curriculum materials of the Alliance for Career and Vocational Education. The Alliance is a consortium of twelve school districts formed by the National Center in 1973 to develop career and vocational curriculum materials. "Resource editions" of these materials had been adapted for mentally handicapped learners. Milwaukee was interested in expanding its services to special students and believed the materials from the National Center were flexible, comprehensive, and easy to use. The use and impact of these materials were evaluated (Anderson and Hull 1981).

The climate for special education is especially good in Milwaukee. Wisconsin has strong special education legislation. Public Law 94-142 is built on Wisconsin's State Law 115. The strong work ethic in Milwaukee fosters community support for helping special education students become productive in the world of work. Since heavy industry supplies much of Milwaukee's job market, an array of jobs within the range of special education students' abilities is available. In 1978, the Milwaukee School District was searching for products to provide vocational education for special students. There was an excellent fit between characteristics of the product and the needs of the

Milwaukee School System. This closeness of fit resulted in several benefits. First, the ready-to-use Alliance materials increased systemwide adoption of a career education program. Second, the Alliance materials provided something tangible to use when bargaining with the state for career education funds. It served as an enticement for establishing some new staff positions. Third, the Alliance materials fit into Milwaukee's long-range plans for establishing a new vocational center to serve only special education students, a plan that is now underway.

Illustrative Case 2

The Rural America Guidance Series (National Center 1977) provides another case example of selective implementation. This series of sixteen handbooks was designed to help rural and small schools implement a career guidance and counseling program. Since development by the National Center was completed, these materials have been adopted by over twelve hundred school district.

A rural school district in Cashmere, Washington was one of the first users of the series. A case study of the innovation's impact was conducted by Modisette and Bonnett (1981). Cashmere is a small community with only a thousand students, yet it has established itself as a nationally recognized leader in career education. When the Cashmere School District decided to adopt the Rural America series, it had many innovative career guidance programs already in place. Cashmere was just beginning its Advisor/Advisee program, which established each teacher as an "advisor" to a group of approximately twenty students for the duration of their stay in school. Through this program, the usefulness of the Rural America series was recognized.

The Rural America series is a process-oriented product that helps a school move through six phases of a planning-implementation cycle. Consequently, it was an excellent companion to a programmatic innovation such as the Advisor/Advisee program. The Rural America series helped the Cashmere schools District define the goals of its new Advisor/Advisee program. As one teacher said, "We had goals before, but after Rural America they were better defined and better formated to meet the needs of kids." The Rural America materials provided a framework for organizing and a process for implementing the Advisor/Advisee program. One principal said, "Without the Rural America series we would have gotten to where we are, eventually, but by using the materials we saved time and made fewer mistakes."

Cashmere found that use of professional materials from a national research center helped sell the Advisor/Adviser program

to community members. As another principal said, "Some parental negativism toward the Advisor/Advisee program died down when they found out we were using 'professional materials' to planing the program."

Guidelines

- Encourage local sites to define their context, needs, and resources systematically.
- Time the introduction of products to maximize favorable conditions.
- Utilize linkages to facilitate choices among R&D products.
- Provide assistance in fitting a product into existing frameworks, programs, and reward structures.
- Begin implementation at one site by using a few innovations rather than encouraging immediate systemwide acceptance of many innovations.

Caveats

- Developers should be prepared for the likelihood that users will make slight modifications in the product.
- Change agents should monitor contextual factors that can influence implementation of the innovation to such an extent that the innovation loses much of its value.

Systems necessary for full use of an innovation should be operational at the time of implementation. These systems are of three types: (1) personal resources (e.g., administrative endorsement, personnel), (2) information resources (e.g., support material training, procedures), (3) physical resources (e.g., facilities, supplies, equipment), and (4) financial resources.

Overview

Support systems may include a complex network of people and procedures or may focus intensively on only one form of support. In either case, support systems link product users with resources and information to encourage effective product use. Support systems have an impact on product implementation. Without time, materials, space, and equipment, teachers frequently report problems when implementing products (Berman and Pauly 1975; Gross, Giaquinta, and Berstein 1971).

Support personnel are the most important resource for implementation of innovations. Berman and McLaughlin (1978) explained, "To increase the likelihood that change will occur as a result of school improvement efforts, you have to involve a person whose function in part is guiding them through the experience." These "change agents" or linkers typically are teachers and intermediate-level administrators. They have the most contact with teachers implementing innovations. Intensive in-service training has consistently been identified as an important strategy for implementation (Fullan and Promfret 1977). This strategy provides teachers with models and experiences that assist them in implementing innovations (Berman and Pauly 1975; Crowther 1972; McDonald and Walker 1974).

Rosenblum, and Molitor (1981) in a national study of research and development utilization, found in-kind contributions from the adopting site (e.g., release time) to promote implementation. Results from this study suggest that staff release time and training by an external agent can significantly affect the degree to which schools implement innovations.

Illustrative Case 1

This case study illustrates the personnel dimension of support systems in an impact study of several special education innovations, e.g. the National Center's It Isn't Easy Being Special series and Michigan's Vocational Education Special

Education Project (Bragg, Hull, and Adams 1981). At one vocational technical institute in Minnesota, support service teams provided a broad range of services for teachers and handicapped students in vocational programs. Some responsibilities were directly related to the implementation of R&D products from the National Center. Support services included inservice workshops, technical assistance, and written newsletters/bulletins. Handicapped students were introduced to R&D products prior to use of the products in mainstreamed vocational classes. Teachers received individual help with product implementation. As a result, levels of use included the following:

- Five R&D products introduced through inservice workshops were implemented by sixteen vocational teachers.
- One product on individualized education programs was used by at least fifty-five teachers and four guidance counselors in sixteen local high schools. The format for individualized education plans evolved from this product.
- Almost 500 students were involved in individual tutoring sessions where the R&D products were used.

Illustrative Case 2

This case study illustrates another critical support system, accessibility of necessary materials and equipment. A product must not only be physically transported to the site of use, but it must also be accessible to the users at that site. Consider the case of microfiche readers that are used with Vital Information for Education and Work System (VIEW) (Florida Division of Vocational Education 1970). VIEW provides current, accurate information about occupations in Florida.

Beginning in 1970, ninety-eight microfiche frame cards containing 600 current occupations in Florida were made available to approximately 300 middle schools, high schools, and other educational institutions. Each microfiche gave requirements of an occupation and listed institutions where training was offered. This system was coordinated with a computer-assisted placement service. It was possible for a student to go from the VIEW cards to Florida Employment Agency cards.

An evaluation of the VIEW system (Hull 1981b) revealed that successful operation was dependent upon the availability of a microfiche reader. In most schools the microfiche readers were located in open, well-lighted areas, resulting in relatively high use of the machines. However, evaluators occasionally found machines in out-of-the-way locations. Students had difficulty finding and using the readers. In a few schools, funds for

reader-printers and supplies were not available. One school had only one reader, resulting in lines of students. The extent to which VIEW was used was directly related to the availability and placement of the microfiche readers and supplies.

These findings illustrate the need to support operational products. Administrators must make sure users have access to products and necessary resources if innovations are to succeed on site.

Guidelines

- Gain the endorsement of administrators for providing necessary support.
- Provide training/assistance in using the innovation.
- Support innovations through some local in-kind contributions.
- Ensure access to supplies, equipment, space, and materials.
- Provide release time for staff to enable them to become involved in implementing the innovation.

Caveats

- Support services frequently require reallocation of resources, particularly of staff, time, and money.
- Some schools may find it difficult to release teachers and/or administrators from present responsibilities to enable them to assist with R&D product implementation.
- Many schools may find it difficult to hire new personnel to facilitate implementation.

Information describing the innovation's resource requirements should allow quick and easy estimates of costs likely to be incurred by an institution adopting the innovation.

Overview

Developers of innovations should be concerned about users' need to estimate costs prior to implementation on site. Prospective users want to know (1) what supplies, equipment, and space are necessary; (2) what expertise is needed to operate the innovation successfully, and (3) what the space requirements are. These estimates should be made prior to implementing the innovation. Information necessary to make these estimates should be readily available. Some R&D reports include a section on implementation requirements. These requirements should be listed for different levels of implementation because an innovation may be implemented in stages. Full implementation of an entire innovation often occurs some time after initial use.

Costs of adopting an innovation, per unit, may be reduced by sharing development expenses or by increasing the volume of products used. Other factors, such as ease of use, the amount of disruption caused by the innovation, and the availability of resources on a particular site, also affect the feasibility of implementing the innovation.

Illustrative Case 1

The Alliance for Career and Vocational Education was formed by the National Center with a consortium of school districts in 1973-74. The districts pooled their resources, expertise, and money to develop and test career exploration, awareness, and planning materials for use at the elementary, junior high, and high school levels. The pooling of resources was a cost-effective way to supply each participating school district with quality R&D products.

The Milwaukee Public School System, a participant in the Alliance since 1974, has accrued cost savings from the Alliance. An evaluation of the Milwaukee program (Anderson and Hull 1981) revealed that the Alliance had proved to be a useful vehicle in expanding Milwaukee's career education program systemwide. Milwaukee's coordinator of the career education said "The Alliance was a vehicle for creating positions for carrying cut

the Alliance programs. My position began that way." She went on to say that "The materials were something to sell." In essence, the Alliance program not only made an innovation cost-feasible for Milwaukee but actually helped the school save money.

Illustrative Case 2

One product that focused on improving education for special needs populations has been disseminated by the National Center since 1979. About four thousand copies of the product entitled Individualized Education Programs (IEPs): A Handbook for Vocational Educators (Phelps and Batchelor 1979) have been distributed throughout the country. Following this extensive distribution, a study was conducted to determine the impact of the R&D product on vocational education programs (Bragg, Hull and Adams 1981). Impact of the product was examined via two on-site case studies and via telephone interviews with about thirty users of the handbook.

The product had a dual purpose that required two different levels of use. The first goal was to present basic information on the purpose for developing IEPs for handicapped students. When handbook users were asked about how they used this first section of the handbook, almost all explained that the information had been used to increase their knowledge about IEPs.

The second goal of the handbook was to provide vocational educators with a format for writing IEPs, as well as with suggestions for appropriate administrative goals and responsibilities. Handbook users gave many reasons for not using this information. Certainly the lack of sufficient resources was one of the most important. In many cases, additional inservice training would have been needed to incorporate this information into the schools' procedures for writing IEPs. Most respondents indicated that their schools did not have sufficient funds to support this task. Thus, even though most respondents believed the information had increased their knowledge about IEPs, the handbook was not used to change practice because of the costs required (funds, time, and staff) to adopt the information in the handbook.

Guidelines

- Compute the cost of the innovation per unit of use and compare it with cost estimates of current similar activities.
- Investigate the possibility of in-kind contributions or assistance from funding sources to reduce implementation costs.

- Determine if there are any implementation requirements, such as release time for teachers that should be negotiated with teacher organizations.

- Look for cyclical considerations in the field (e.g., season of the year) that could influence the cost of innovation installation or availability of funds to purchase innovations.

- Develop a schedule for lead time considerations when implementing the innovation.

- Provide a range of costs rather than exact estimates. Inflation and other factors impinge on cost estimates made by developers.

Caveats

- Feasibility estimates should guard against inferring cost-related outcomes from the innovation. It is difficult to place monetary values on outcomes; what happens following implementation depends upon the resources at a particular site.

Multiple Patterns of Use

Use of innovations will vary depending on the type of use, its intensity, level frequency, and extent. The users' settings, roles, and demographic characteristics create the conditions for different types of use. Use of R&D by users other than the primary user audience should be encouraged.

Overview

Teachers and other R&D product users should try different ways of using an innovation in diverse settings. Developers cannot anticipate all of the conditions faced by a user on site; therefore, imaginative use can contribute to the benefits of the innovation.

Hall et al. (1975) have developed a "levels of use" framework for analyzing innovation adoption. The framework defines eight discrete levels of use: (1) non-use, (2) orientation, (3) preparation, (4) mechanical use, (5) routine use, (6) refinement, (7) integration, and (8) renewal. This framework relates to large-scale innovations in which significant levels of adoption are expected. It may be overly complex for analyzing smaller innovations, such as a single research report, instructional guide, or conference. A more appropriate framework for analyzing a single product's pattern of use may be: (1) scan (2) read, (3) study, (4) reference, (5) share with others, (6) apply, and (7) adapt (Adams 1980).

Often, there are concrete demographic and contextual factors that help determine patterns of use. Some examples of context descriptors of use are: (1) type of program, (2) grade level, (3) size of enrollment, (4) length of program, (5) program content, and (6) number of different products used. As should be apparent, patterns of use is a multifaceted concept that can be interpreted in numerous ways, depending on the nature of the product.

Illustrative Case

The strategic distribution of Performance-Based Teacher Education (PBTE), a curriculum developed at the National Center has resulted in multiple patterns of use. A case study of this innovation (Adams, MacKay, and Patton 1981) revealed that creative adaptations of PBTE occurred in many agencies across the nation. In colleges and universities, PBTE was used for

preservice and in-service vocational teacher education programs. PBTE was used to train teachers in agriculture education, business and office education, distributive education, health education, home economics education, industrial arts, technical education, and trade and industrial education. At secondary schools, PBTE modules were used to upgrade the skills of practicing teachers through in-service programs. At postsecondary institutions, PBTE modules were used for staff development programs, most frequently as part of a comprehensive personnel evaluation and development system. In addition to education agencies, over 220 noneducation agencies (such as Caterpillar Tractor Company, IBM, and Union Carbide) used the PBTE modules, most frequently as part of company training programs for improving instructional techniques.

Guidelines

- Determine demographic and contextual factors that define patterns of use.
- Consider the intensity of use when measuring patterns of use.
- Consider the frequency of use in patterns of use.
- Consider the extent of use over time in patterns of use.
- Look for secondary uses in all patterns of use.

Caveats

- The patterns of use must emerge from the data collected. The evaluator should be careful not to allow personal perceptions to influence the construction of pattern categories.
- It may not be possible to determine the intensity of use without spending inordinate amounts of time observing or interviewing. Alternate measures of intensity of use, such as lesson plans and curriculum outlines, may be used with proper disclaimers.

R&D products should be used frequently enough and long enough for their use to become an integral part of current practice. The amount of time that users actually use the product should be maximized.

Overview

A number of evaluations during the past decade revealed that many innovations got poor marks because they were not implemented as planned. Research on school effectiveness (Fisher, et al. 1978; Stallings 1974) has concluded that the amount of time students' engaged in a particular subject is one of the most critical factors influencing student achievement. The amount of time individuals spend actually using an innovation is directly related to its degree of impact. According to Crandall, Bauchner, Loucks, and Schmidt (1982) the major factor producing change in classroom practice is the amount of classroom time spent on the new practice by the teacher. Classroom time also accounts for fidelity--how close new users come to reproducing the developer's ideal. Crandall also emphasized that the amount of time teachers spend on a new practice is affected by their level of commitment. The more committed they are, the more classroom time they spend. Degner (1982) reported that specific assistance is another factor that increases the amount of time that teachers spend on a new practice. Specific, practical, teacher-focused assistance can help a teacher concentrate on using the new practice effectively.

Illustrative Case

The Career Planning Support System (CPSS) illustrates the importance of time on task. The Career Planning Support System (National Center 1978) was designed to help schools use a systems approach to develop a customized career guidance program. The innovation guides a school through six systematic steps:

1. Assessing needs
2. Developing objectives
3. Assessing resources
4. Developing strategies and programming
5. Implementing career development units
6. Evaluating outcomes

Handbooks and procedural guides were designed to help schools complete each step in developing customized career guidance programs for their unique needs and resources. The innovation is quite flexible. Schools can spend very little time or can spend extensive time on implementation. Outcomes can range from a few supplemental career development units to a comprehensive career guidance program.

The significance of time on task to this innovation was especially apparent at the American Senior High School in Hileah, Florida. This school began to use CPSS in September 1979. During the 1979-80 school year, the school received a $5,000 grant to provide teacher release time for implementation. During this year, the school made substantial progress in identifying needs and developing a few career development units. However, once the grant ended and teacher release time was no longer funded, the innovation came to a complete halt. As a group, teachers were in favor of the innovation and felt that guidance services were the weakest area in the school; however, without release time there was no incentive to work on it. The teachers agreed that if they could have taught four classes rather than five, most of them would have assumed a specific, ongoing responsibility for implementing the innovation.

Guidelines

- Avoid burning up excessive time at the beginning of implementing an innovation (e.g., selecting an innovation, planning for use, developing materials). Save time for activities after the innovation is in use (e.g, implementation schedules, follow-up training, and procedural details).
- Allocate the greatest portion of time to the most critical parts of the innovation.
- Provide release time for relevant audiences to implement the innovation.
- Provide practice-specific assistance in using the innovation.
- Maintain records of the amount of time spent on various parts and phases of the innovation. Obtain an accurate measurement of the time spent actually using the innovation compared to time spent planning for use of the innovation.

Caveats

- The mechanical use of an innovation can negate the time-on-task variable. User enthusiasm can influence impact of an innovation.

- A commitment to use an innovation must be accompanied by a knowledge of how to use it and a belief in its ability to improve vocational education. Otherwise, the effects of time on task are likely to be diminished.

Use of innovations should be intensive and pervasive throughout the organization, drawing on personal commitment to institutionalize the product into organizational routines.

Overview

Organizational use of an innovation can be enhanced by professional commitment. Crandall et al. (1982) describes commitment as recognition of the importance of an innovation to one's daily professional life. Individual users' acceptance of an innovation contributes to organizational change. Crandall also identified teacher commitment as an important predictor of change in classroom practice. Sieber (1981) concured with the importance for individuals to internalize knowledge and create a sense of "ownership." He described this characteristic as a powerful incentive for change.

A similar concept that is associated with integrated use is the notion of "institutionalization." This notion implies complete adoption of an innovation by an organization. When a product becomes institutionalized, people in the organization may no longer recognize the innovation as one that was developed externally! Evaluators may even have difficulty finding traces of the externally developed product.

Illustrative Case

In the public schools in Carroll County, Maryland, special education teachers were using the Employability Skills for Special Needs Students (Carrol County Public Schools 1978) curriculum to teach students basic vocational competencies. Use of this curriculum was pervasive throughout the county. In fact, all special education teachers were using the curriculum in their classes. A study conducted by Hull and Bragg indicated that the curriculum was the foundation for the instruction of mentally handicapped students.

There were several reasons for teachers' use of this curriculum. First, the curriculum had been developed within the county. Ten teachers were paid by the county to develop units in their schools. Four schools in the county had been involved in the development and field testing. This involvement created a sense of "ownership" in the curriculum among teachers.

Second, once the curriculum was fully developed, all teachers in the county received in-service training. This was

particularly important for new teachers entering the system. The county coordinator for the curriculum development project assisted teachers with implementation of the curriculum. Implementation usually went smoothly, since the curriculum was designed for the county and was customized for those schools.

Third, the curriculum was comprehensive. Development of the curriculum took two years, and teachers began to use it in its final form in 1978. The curriculum had been in place in some of the schools for about five years at the time of the evaluation site visit. Teachers and administrators were familiar with its strengths and had adapted to its weaknesses. It had become a standardized course of study for handicapped students across the county schools.

Fourth, the curriculum was complete; it was sequenced by grade level, thus promoting use with students. In addition, the curriculum-referenced resources were readily available in the county. In summary, the curriculum had been fully integrated into the school system.

Guidelines

- Encourage adoption of the innovation over a long enough time period to create user identification with it.
- Develop the innovation fully so it is complete and is not dependent on resources or expertise outside of the organization.
- Encourage users to adapt and refine the innovation continually to maximize product-site fit.
- Encourage enough users in an organization to implement the innovation to create a "critical mass" of support.
- Encourage users to reevaluate their use of the innovation and to review their use through exploring new developments in the field.

Caveats

- It may take a long time for an innovation to become fully integrated into an organization. Evaluators and others should not expect too much, too soon.
- Speed of integrated use is directly related to the size and complexity of the organization. Large, complex organizations usually assimilate innovations more slowly than do small, simple organizations.

The R&D product and its implementation should meet users' expectations and should result in a positive user attitude toward the product. User satisfaction may be indicated by product advocacy and/or creative adaptations.

Overview

Users' expectations can be met a number of ways. Rogers (1962), Zaltman (1980), and Rothman (1974) have spoken of the compatibility of the innovation with the user's established norms and values. A similar but more important idea is relative advantage, which is when an innovation exhibits merit above and beyond the existing situation. In other words, it is superior to the ideas it supersedes (Rogers 1962). As a result, the user tends to experience personal satisfaction from implementing the innovation.

Illustrative Case

A two-volume handbook on conducting follow-up studies, entitled Guidelines and Practices for Follow-up of Former Vocational Students (Franchak and Spier 1978), was published by the National Center. This product was rated especially high on "user satisfaction" and provides a good case for illustrating this criteria.

Through a follow-up evaluation (Brickell and Paul 1980), a group of practicing evaluators who had read the two handbook volumes were interviewed. One question asked the respondents to spend $1,000 hypothetically on ten different kinds of evaluation data, which included test scores, review teams, observations, management information systems, and follow-up data. Follow-up data came out as the big winner, receiving 60 percent of the funds. According to the spending pattern, follow-up data were viewed as the most important evaluation data. Users saw a critical need for information on this topic.

Users also reported being satisfied with the coverage and quality of the handbook. They cited the volumes' thoroughness, readability, organization, and comprehensiveness. A particular strength of the handbook was its assimilation of many sources of information about follow-up studies in one book. Virtually no users could think of any other publication that they felt was better than this handbook on the topic of follow-up studies.

Guidelines

- Determine if the product effectively met needs norms, and values of the intended users.
- Assess the product's relative advantage over other related products in use.
- Determine if users recommended the product to their friends.
- Solicit users' impressions of the major strengths and weaknesses of the product.

Caveats

- Users may be satisfied with using existing, low-quality products rather than adopting a higher quality innovation that is complex and disruptive.
- Some users may require more time to become satisfied with a product than others (i.e., early vs. late adopters) than others.

Innovations should contribute to changes in individuals' attitudes, knowledge, and/or performance.

Overview

The use of innovations should contribute to individual growth. Effects may filter through organizational layers of or may be interpreted by the perceptions of textbook writers, but R&D results should ultimately change individual lives. These changes may be cognitive (Bloom 1956), affective (Krathwohl, Bloom and Masia 1964), or action-oriented (Harrow 1972). Developers and distributors should specify objectives for individual growth that are relevant to individual use.

Some educational research takes years before it is translated into useful programs. Reinforcement plays an important part in instructional material development today. Such fundamental variables as reinforcement were first demonstrated in animal experiments before being developed and tested with humans. The contributions of B. F. Skinner's investigations to programmed instruction have been documented by Suppes (1978).

The use of individuals as sample units and/or as units of measure gives increased flexibility to impact studies. Individual scores on tests can be computed as gain scores in pretest, posttest measures or used as covariants to screen out unrelated influences in the impact design. Experimental methods have been used to document the impact of R&D on personal growth.

Illustrative Case

One successful use of R&D findings to bring about individual growth is the National Academy's In-residence Program at the National Center. This open-entry, open-exit program provides an opportunity for vocational educators to use the resources of the National Center at their own pace and expense. In-residence programs range from one week to six months on topics selected by the participant. The primary factor in the participants' growth is access to knowledge resources. Library books, National Center publications, Educational Resources Information Center (ERIC) microfiche, and National Center staff interact to support participants' growth. Learned facts are buttressed by group interactions with other program participants or with visiting authorities on topics of special interest.

A five-year follow-up study (Hull and Hassan 1982) revealed several areas of program impact on participants. Three-fourths of the in-residence program participants reported significant growth in personal and professional goals. As a result of the in-residence program, they gave presentations, workshops, and courses; shared information through personal consultation; received career changes or promotions; and wrote one or more publicatons. Personal growth also usually resulted in changes made by individuals in their organizations. These changes included policy recommendations, improved curriculum offerings, initiation of new research, improved instructional methods, and changed organizational structures. This contact with research findings in a scholarly atmosphere enhanced the likelihood of personal growth. The pace of the participants' learning was correlated to their needs and desires.

In-Residence participants were asked to estimate the number of individuals they had personally influenced as a result of knowledge gained through their program. Eighty percent of the sixty-four participants were able to identify eighty-eight thousand individuals (mostly students and teachers) who had been influenced by the in-residence program activities. These people represented a secondary effect of individual growth. They were people who had contact with the primary participants and who grew as a result of this contact.

Guidelines

- Specify intended outcomes for individual growth.
- Assess attitude changes through qualitative questions (e.g., What are your feelings about the innovation?)
- Assess changes in knowledge through written tests and structured interviews.
- Assess changes in performance through performance tests and direct observations.

Caveats

- Many factors impinge on individual learning. Rational information may not be the basis for decisions affecting individual growth.
- Changes in attitudes are particularly difficult to measure. Prolonged exposure to an innovation may be required to change attitudes and beliefs.

- Short-term gains in student learning may disappear when students are retested several months later.

- Comparison groups for field experiments are particularly difficult to locate for impact studies.

R&D should contribute to beneficial changes in organizational policy, programs, practices, and/or structure, as reflected by savings in costs and time over current practice.

Overview

Organizational change involves a wide range of effects that occur in educational institutions as a result of using an innovation. Organizational change may be hampered by many inherent characteristics (e.g., the size of the organization, the number of years it has been in existence, the length of time staff have been employed, and previous disposition toward change) (Downs 1967). Educational organizations vary widely on these factors.

Change in an organization implies more than routine adoption of a new product. The use of the innovation has gone beyond adoption to produce some type of improvements, according to Yin, Heald, and Vogel (1977). Cost-benefit measures may be employed to determine which program change is best for an organization (Rossi and Freeman 1982).

The importance of multi-year funding for organizational changes cannot be overemphasized. Adequate resources (e.g., time and money) allow staff to be trained and sufficient expertise to be developed within the organization. An innovation may disrupt routine and disturb people's domains of influence. This is why sustained support, both interpersonal and financial, is indispensible for organizational growth and renewal. The case study that follows illustrates not only organizational change but also inter-agency support for that change.

Illustrative Case

The case of the Career Resource Centers (CRCs) in Pennsylvania illustrates the need for sustained financial support (funds) and involvement of staff throughout a school. Sixty-four CRCs were established by the Pennsylvania Department of Public Instruction in 1972 to provide current, accurate career information. A set of guidelines for these centers had been developed, based on experiences in five pilot sites. The following observations, taken from a study of product impact (Hull 1980), emphasize procedures that enhanced the institutionalization of the innovations:

- Establishing the CRCs was an interdepartmental initiative. The Pennsylvania Research Coordinating Unit took

the lead with the tacit approval and cooperation of the state's Vocational Guidance Section and its Division of Career Education.

- Funding was sustained and prorated, based on the number of years the particular CRC had been established. All of the costs for the first year of operation were paid by the state. Costs in subsequent years were gradually turned over to he local school districts until all or most of the costs were being paid by local districts at the time of the impact study.

- CRCs were staffed by local agencies. Differentiated staffing patterns characterized the centers. Most had a guidance counselor or occupational specialist in charge of the CRC, with teacher aides or students helping with use of the equipment and/or shelving of publications.

- Systematic contact was made with teachers to solicit use of the CRCs. This use took many forms (e.g., career awareness, assignments in class, presentations by the CRC director, and drop-in use of the CRCs by teachers).

This innovation resulted in organizational change because many separate activities came together at the Career Resource Centers to provide a viable, integrated mechanism for the school.

Guidelines

- Specify intended outcomes for organizational change.

- Compare costs of operation after the innovation has been implemented with prior cost records.

- Look for structural changes, e.g., in the organizational chart, for indications that the R&D product has had an effect on the organization.

- Examine policy statements for information from R&D reports.

Caveats

- Changing groups of people in organizations is more difficult than influencing a single person.

- Structural changes take more time than other types of changes and may not be reflected in immediate benefits.

- Each organization exists in a unique context that must be considered when introducing research-based innovations.
- Organizational change tends to require an extended time period.

R&D should contribute new and significant information with the potential to advance knowledge, improve current practice and/or influence social systems.

Overview

The impact of research on education has been summarized by Suppes (1978) in a series of case studies. One is struck by the somewhat fragmented nature of the impact of research as well as by the rather optimistic tone of the report. There are areas where research has had great impact on practice. For example, the theory of mental tests and pupil classification has been applied in the public schools. Thorndike's theory of learning (1913) has been applied successfully to the teaching of arithmetic. In vocational education, the use of experienced-based cooperative education has influenced the way employers acquire skilled labor.

Systematically derived information from R&D is intended to bring change and improvement to education, but it is difficult to sustain the research funding needed to resolve important, persistant problems. In a report to the National Institute of Education by the National Academy of Science (Kiesler and Turner 1977) recommended more funding for fundamental research relevant to education. This was to be for long-term research intended to affect broad sections of society. In practice, major changes in society come from a combination of factors. Strategic funding of studies is required to maximize the benefits from scientific knowledge.

Illustrative Case

The Performance-Based Teacher Education (PBTE) curriculum is an example of an innovation that has facilitated major changes in teacher education. PBTE rode the crest of a major reform movement in education. The initial development of PBTE was just ahead of the competency based movement. Consequently, the product was ready to meet a growing interest in and need for performance-based materials.

Based on in-depth interviews with forty-five college and university administrators and faculty (Adams, MacKay, and Patton 1981), PBTE was found to precipitate significant changes in many vocational teacher education programs. In a period of declining need for secondary teachers, the PBTE curricula helped university vocational education departments survive the crises of funding

cutbacks and faculty retrenchment. Because PBTE lends itself to an individualized approach, universities were able to provide field-based programs to larger service areas. PBTE also made it possible for universities to attract community support, receive state funds for PBTE program development, and maintain enrollment. PBTE has accomplished the following:

- Increased access to vocational teacher certification by providing self-contained instruction especially that was useful in rural and isolated areas
- Increased flexibility in getting immediate help to new teachers whenever they were hired
- Increased productivity of teacher education programs at some institutions by shortening the time required to certify vocational teachers and lowering costs by using differentiated staffing
- Reduced variability and increased accountability of vocational teacher education curricula through standardizing the skills vocational teachers were required to master
- Significantly changed the role of the university teacher from a classroom lecturer to a learning facilitator working with students on a one-to-one basis

Guidelines

- Specify societal effects in impact studies.
- Pick topics carefully when assessing societal impact because timing is important.
- Look for preliminary indicators of potential widespread changes in an institution so these areas can be supported.

Caveats

- The impact of R&D on society may be the result of some unpredictable factors (e.g., an idea whose time has come, or that is beyond the control of most individual investigators.
- Societal effects are pervasive, take longer to emerge, and are difficult to measure in any single impact study.

CHAPTER IV

APPLICATION AND USE OF CRITERIA

Persons most likely to use the R&D impact criteria discussed in this document are research administrators and others concerned with using R&D products to improve vocational education programs. Project directors can use these criteria to monitor development and dissemination activities. Much of the R&D impact in the later stages of program improvement is determined by activities in the development and dissemination stages. A linear continuum ties together what otherwise may appear as discrete activities. This is true for R&D projects in local education agencies as well as those in state departments, universities, and research centers.

Attainment of these criteria improve the chances of an R&D product to create significant change in vocational education. This chapter discusses some ways a research administrator may operationalize R&D activities to meet these criteria. The criteria in each stage will be discussed separately.

R&D Program Improvement Stages

Research administrators who look for innovative products to share with others generally apply the criteria of systematic development, high quality, and user orientation to the products. Many research coordinating units have mini-grant programs that award money to individual teachers to develop ideas for possible distribution to other teachers. In examining the products from these mini-grant programs, research administrators should look

for either a product tested over a long period of time by teachers or for a product used by a number of teachers to satisfy the criterion of systematic development. Review cycles that incorporate recommended changes into the product after trial use improve its chances of having a positive impact. Development of checklists to rate product quality on different dimensions aids in the revision process.

One way to ensure attention to user orientation is to hire practitioners either to help develop the product or to review it. Field tests of product quality with students in a local education agency setting are particularly important for instructional materials. R&D project directors should indicate in their technical plans the relevant criteria for impact assessments. The careful deployment of field site testing materials, for example, can assure geographic distribution of knowledgeable persons in the field who can be called on later to offer technical assistance to sites adopting a product.

Dissemination

Sometimes project directors are responsible for disseminating the results of research or development. When this happens it is easy to miss persons who need the material. The criteria of strategic dissemination, multiple channels, and widespread dissemination are more likely to be met if the product is disseminated by the sponsoring organization. Decisions to share a product with a particular client group can be made strategically to satisfy cost-benefit considerations. There

are never enough copies to go around; nor is dissemination the last stage of a development activity. Rather, it should be viewed as an opportunity to place project results in the hands of the people who need them.

Information about a product can be condensed and spread to a wider audience by using mass media than by relying on word-of-mouth recommendations from the product. Mass media information allows interested persons who are not in the primary audience to request a copy. Whereas the burden of seeking R&D information is on the user, a project disseminator can make it easy to find relevant information.

Implementation

Disseminating an R&D product with a potential for high impact does not guarantee results. The products have to be used and, before they can be used, they must be implented. Adopting sites differ in their ability to support innovations. Some can accept an R&D product in its initial form. Others have to modify the product for it to be acceptable. Feasibility studies of costs likely to be incurred in operation of the innovation are necessary to insure smooth implementation and operation. Technical expertise and administrative endorsement are other support variables that can make a difference in the innovation's survival.

A new idea trying to gain a foothold in established practice is fragile; it needs favorable conditions. This is why selective implementation is recommended. Not all parts of an organization

accept an innovation equally well. The services of volunteers, for example, are recommended to provide a favorable context for early use of an innovation. Innovations with adequate support systems stand a better chance of creating a positive impact than those without such support.

Utilization

Innovations implemented in various degrees will result in multiple patterns of use. Some teachers will be better prepared to use a new idea or simply be more naturally inclined to use a particular product. For example, a curriculum plan using teachers as resource personnel to answer students' questions appeals to some teachers more than others. Teachers who are confident, interactive, and not tied to reference materials are likely to use such an innovation. Thus, style of teaching can become a selection factor in using an innovation when the directions of use cannot always be anticipated.

In order for an innovation to have a positive impact, it must eventually be integrated into the total operation of the adopting organization. Selective implementation may be necessary, but the innovation can not remain an isolated part of an educational system. Whether a product is an innovative management procedure or is a new way of teaching employability skills, it must be used for a specific length of time for impact to take place. Time on task is another important consideration if changes are expected in individuals, organizations, or society.

Effects

Effects of the use of an innovation should be monitored and recorded for two purposes: accountability and planning. The criteria of individual growth, user satisfaction, organizational change, and societal contributions should not be applied to every R&D product. Some products, such as a technique for using a hammer correctly in carpentry shop, relate only to skill development of the individual. Other products, such as criterion-referenced testing, have potential for changing the way classes are organized. Some products, such as performance-based teacher education, even have potential for making the educational process more efficient and increasing the contribution of education to society. Changes should be recorded, because research administrators need to know if the money and time used to develop and diffuse R&D products have been worthwhile.

There must be a return to society for investments in R&D to continue. Such benchmarks of accountability serve a double purpose. Not only do they indicate the effectiveness of current R&D, but they also provide a baseline for measuring future R&D effects. Impact studies of R&D products should indicate if a problem has been at least partially resolved. In this way, impact studies provide ongoing needs assessments.

Assessing Impact

Assessment of impact typically requires multi-method approaches. Impact should be assessed at each stage of the R&D process. Figure 4 provides sample approaches that may be used to

Figure 4

SAMPLE APPROACHES FOR ASSESSING IMPACT

DEVELOPMENT	DISSEMINATION	IMPLEMENTATION & USE	EFFECTS
Critical review:	Recordkeeping & document analysis:	Quantitative surveys:	Qualitative Studies:
Users and experts can be involved at various points in the development process to critique the innovation against performance standards.	Establishing a system of records is especially useful for tracking dissemination of innovations to various users, organizations, and locations.	Surveys that employ structured questions are useful for identifying patterns of implementing and using innovations. Surveys can also help identify key users and innovations that are likely to produce effects.	On-site case studies using direct observation and personal interviews are useful for discovering the effects of an innovation. Observing an innovation in action in its natural context provides a rich description of effects.
			Experimental studies:
			Once a clear description of the effects of an innovation has been established, experimental studies may be useful to verify causal inferences.

assess impact throughout the R&D process. Some impact approaches (e.g., those in figure 4) can be used at every stage of the R&D process.

A few general principles for designing impact assessments are as follows:

1. Specification of data requirements is necessary for impact assessment. As the requirements become more specific, quantitative methods (e.g., survey questionnaires) become more useful. However, some impact can be unanticipated or difficult to detect. For such inquiries, qualitative methods (e.g., successively focused interviews) yield the best information.
2. Resources (e.g., time and money) for impact studies are usually in short supply. The best combinations of approaches for assessing impact are those that provide the minimum required information at the least cost.
3. Time is necessary for effects to occur. A complex innovation requiring extensive change in the adopting organization will require more time for its effects to emerge than will one requiring little organizational change.
4. An alliance of both quantitative and qualitative, evidence should be used to assess impact. Data from both approaches may be merged in the same report,

providing that the integrity of each data type is maintained.

5. Studies that facilitate cross-site synthesis should be more effective in determining impact than an array of individual studies would be.
6. Impact studies should allow for unanticipated and idiosyncratic discoveries.

The Appendices contain sample instruments for assessing the sixteen impact criteria presented in this report. Appendix A contains a User Survey that employs structured quantitative questions to examine various dimensions of impact. Appendix B contains an Interview Guide that employs a series of open-ended, qualitative questions for describing impact. These instruments represent two examples of the kinds of impact assessment tools that could be constructed. Many of the items have been drawn from impact studies conducted at the National Center. Each impact study demands a unique assessment tool. The relevance of the sample instruments to a particular impact study would be determined by the purpose of the study, the user population, and conditions on site.

Summary

The state of the art for conducting R&D has advanced in the past twenty years. A knowledge base has evolved that, if consistantly implemented, could enhance the payback from the R&D dollar substantially. A technology is developing to insure planned change as a result of programmatic R&D. Society can no longer afford wasteful and unnecessary R&D that fails to improve vocational education programs. Important performance criteria must be developed and met to assure wise use of R&D resources.

This report presents an organized research-based taxonomy of sixteen criteria for creating impact. The taxonomy is based on the premise that impact potential can be incorporated into products at each stage of their development and use. The stages used in this report are development, dissemination, implementation, utilization, and effects. If a product meets the first twelve criteria in the four formative stages, it gains potential for creating impact in the fifth stage, effects.

During the development stage, the product should be (1) systematically developed, (2) high quality, and (3) user oriented. The dissemination stage must use (4) strategic dissemination and (5) multiple channels of communication to increase the likelihood of (6) widespread dissemination of products. The implementation stage must be (7) selective and (8) cost feasible as well as assuring necessary (8) support systems are in place for product use. The utilization stage should support (10) integrated use and sufficient (11) time on task so that (12) multiple patterns of use result.

If formative impact criteria are met, an R&D product has a much greater chance of producing summative impact when the product is disseminated and used. Four criteria are listed in the effects stage of the taxonomy. They are (13) user satisfaction, (14) individual growth, (15) organizational change, and (16) societal contributions. These sixteen criteria should be systematically and incrementally met throughout the R&D program improvement process to result in maximum impact.

The sixteen R&D impact criteria presented in this report need to be refined and further developed. Next stages include use of the criteria as a collective set of impact indicators. R&D project directors could assess project activities to determine if the criteria have been met at each stage of the process. Sets of questions should be developed to interpret each criterion for particular products. The sets of questions in the appendices provide a point of departure for writing measurement items; but, they do not substitute for impact assessment items written by a person knowledgeable about the particular R&D innovation. Trial use of these criteria are likely to lead to further refinement. Additional criteria may be needed or some may be deleted. Even the program improvement stages themselves may be modified.

One of the most important concepts to emerge from this report is the notion of "impact potential." This concept may prove to be very helpful as researchers try to anticipate the amount and direction of change resulting from product use.

Impact potential could become a key indicator in determining the amount of money that should be spent to diffuse a R&D product. In any event, these criteria merit serious consideration by researchers and evaluators as they continue their quest to maximize impact from R&D products.

APPENDIX A

USER SURVEY OF INNOVATION IMPACT

USER SURVEY OF INNOVATION IMPACT

1. To what extent do you think the innovation met the following criteria? (Check one for each item.)

Criteria	Not at All		To Some Extent		To a Great Extent
Based on important needs	1	2	3	4	5
Built on existing knowledge	1	2	3	4	5
Involved users in design	1	2	3	4	5
Built on theory or conceptual framework	1	2	3	4	5
Systematically developed	1	2	3	4	5
Carefully tested	1	2	3	4	5

2. How would you rate the quality of the innovation on the following criteria? (One rating per criteria.)

Criteria	Not Applicable	Poor	Fair	Good	Very Good	Excellent
Relevance to my needs	0	1	2	3	4	5
Scholarship	0	1	2	3	4	5
Ease of use	0	1	2	3	4	5
Readability	0	1	2	3	4	5
Equity	0	1	2	3	4	5
OVERALL QUALITY	0	1	2	3	4	5

3. To what extent were you involved in the following activities?

STAGE OF INNOVATION	EXTENT OF INVOLVEMENT					
	Not at All		To Some Extent		To a Great Extent	Not Applicable
Design	1	2	3	4	5	0
Development	1	2	3	4	5	0
Testing	1	2	3	4	5	0
Dissemination	1	2	3	4	5	0
Receiving training/ technical assistance	1	2	3	4	5	0
Giving trainging/ technical assistance to other users	1	2	3	4	5	0

4. How did you learn about this innovation? (Check all that apply.)

- ☐ Received brochures/flyers
- ☐ Read product announcements/ articles in periodicals
- ☐ Saw displays at conferences
- ☐ Participated in workshop(s)
- ☐ Received technical assistance
- ☐ Visited a demonstration site
- ☐ Worked with a linker
- ☐ Involved in a network
- ☐ Other (please specify) _____

5. Indicate the number of people for each role and organization that you have personally assisted in becoming familiar with this innovation.

ORGANIZATIONS	ROLES: Administrator/ Manager	Teacher/ Staff	Student/ Client
a. International	_____	_____	_____
b. National education	_____	_____	_____
c. State education	_____	_____	_____
d. Local education	_____	_____	_____
e. Primary/secondary	_____	_____	_____
f. Postsecondary	_____	_____	_____
g. College/university	_____	_____	_____
h. Public sector	_____	_____	_____
i. Private sector	_____	_____	_____
j. Research	_____	_____	_____
TOTAL	_____	_____	_____

6. What were your costs for implementing the innovation?

Purchasing materials $_____

Salaries for release time $_____

Purchasing or renting supplies, equipment and space $_____

Other services/eg. computer time $_____

Other _____ $_____

7. How important were the following factors in influencing implementation of the innovation by your organization? (Circle your rating for each factor.)

FACTOR	DEGREE OF IMPORTANCE Low		Medium		High
Leadership of top administrator	1	2	3	4	5
Teacher's orientation to change	1	2	3	4	5
Availability of funds	1	2	3	4	5
Availability of time for implementation	1	2	3	4	5
Size of the organization	1	2	3	4	5
Teacher's influence in decision making	1	2	3	4	5
Other _____	1	2	3	4	5

8. To what extent were adequate support systems available for implementing the innovation?

TYPE OF SUPPORT	ADEQUACY Not at All		To Some Extent		To a Great Extent
Administrative endorsement	1	2	3	4	5
Personnel involved	1	2	3	4	5
Support material	1	2	3	4	5
Training	1	2	3	4	5
Funds	1	2	3	4	5
Equipment	1	2	3	4	5
Supplies	1	2	3	4	5
Other _____	1	2	3	4	5

9. How did you use the innovation? (Check all that apply.)

A. TYPE OF PROGRAM

- ☐ Preservice
- ☐ Postsecondary staff development
- ☐ Postsecondary classroom
- ☐ Secondary inservice
- ☐ Secondary classroom
- ☐ Other _____

B. VOCATIONAL SERVICE AREA

- ☐ Trade & industrial education
- ☐ Health occupations education
- ☐ Industrial arts education
- ☐ Technical education
- ☐ Business & office education
- ☐ Distributive education
- ☐ Agriculture education
- ☐ Home economics education
- ☐ Other _____

10. Characterize your use of the innovation by circling one number on each of the following scales.

Frequent	1	2	3	4	5	Seldom
Scanned briefly	1	2	3	4	5	Studied intensively
Routine	1	2	3	4	5	Creative
Used for a short period	1	2	3	4	5	Used for a long period
Primary	1	2	3	4	5	Secondary
Alone	1	2	3	4	5	With others

11. Characterize use of the innovation by your organization by circling one number on each of the following scales.

Few	1	2	3	4	5	Many
Uniform	1	2	3	4	5	Varied
Smooth	1	2	3	4	5	Difficult
Working alone	1	2	3	4	5	Collaborating with others
Integrated	1	2	3	4	5	Separate
Routine	1	2	3	4	5	Creative
Short-range	1	2	3	4	5	Long-range

12. Record the amount of classroom time (in person-days, 8 hours = 1 day) you spent actually using different sections of the innovation during the past year.

	Jan. 1 - March 31	April 1 - June 30	July 1 - Sept. 30	Oct. 1 - Dec. 31	TOTAL PERSON-DAYS
Section I					
Section II					
•					
•					
•					
Section N					
TOTAL PERSON-DAYS					

13. Identify three significant developments in your professional life that have occurred as a result of using the innovation.

1. _____

2. _____

3. _____

14. How much has the innovation contributed to your personal growth on each of the following dimensions?

	None	A Little	Some	A lot	A Great Deal
Added new knowledge	1	2	3	4	5
Improved performance	1	2	3	4	5
Influenced attitudes	1	2	3	4	5

15. Identify three significant contributions to your organization that have occurred as a result of using the innovation.

1. _____

2. _____

3. _____

16. How much has the innovation contributed to organizational change on each of the following dimensions?

	None	A Little	Some	A lot	A Great Deal
Saved time	1	2	3	4	5
Saved dollars	1	2	3	4	5
Improved programs for clients	1	2	3	4	5
Influenced policy	1	2	3	4	5
Changed organizational structure	1	2	3	4	5
Improved practices of staff	1	2	3	4	5
Improved research	1	2	3	4	5

17. Based on your experience with the (innovation name) how satisfied are you with its overall performance? (Circle one)

1. Very dissatisfied
2. Somewhat dissatisfied
3. Undecided/neutral
4. Somewhat satisfied
5. Very satisfied

18. Identify three significant long-range contributions to society that result from this innovation.

1. _____
2. _____
3. _____

APPENDIX B

INTERVIEW GUIDE FOR INNOVATION IMPACT

INTERVIEW GUIDE FOR INNOVATION IMPACT

The following core questions represent a less structured approach to impact assessment. They would be asked of developers and users in a qualitative interview. Other questions, based on responses to the initial question, would follow in each criterion category.

CRITERIA	CORE QUESTIONS FOR DEVELOPERS	CORE QUESTIONS FOR USERS
Systematically conducted	1. How would you describe the process followed in developing the innovation?	1. How would you describe the process followed in developing the innovation?
High quality	2. How would you characterize the quality of the innovation?	2. How would you characterize the quality of the innovation?
User-oriented	3. How was the innovation oriented to users?	3. How were you involved in developing and implementing the innovation?
Multiple communication channels	4. What dissemination activities were conducted?	4. How did you receive information about this innovation?
Widespread dissemination	5. How many copies of the innovation were disseminated by type of role, type of organization, and geographic location?	5. How many copies of the innovation did you receive? What were the roles, organizations and location of users?

CRITERIA	CORE QUESTIONS FOR DEVELOPERS	CORE QUESTIONS FOR USERS
Strategic dissemination	6. How was dissemination individualized for different types of users and sites?	6. Describe start-up activities you participated in to learn how to use the innovation.
Selective implementation	7. What implementation strategies were used to help each site adopt the innovation?	7. Wnat factors unique to this site and to the people involved affected implementation?
Cost feasibility	8. What are the total and unit costs for implementing the innovation?	8. What have been your costs for implementing the innovation including in-kind contributions?
Support systems	9. What types of support were available for implementing the innovation?	9. What type of support did you personally receive to implement the innovation?
Multiple patterns of use	10. How was the innovation used with different types of users?	10. How did you use the innovation?
Time on task	11. How much time was spent actually using the innovation in each setting?	11. How much time have you spent actually using this innovation?
Integrated use	12. How was the innovation integrated into ongoing programs and practices?	12. How have you integrated the innovation into your ongoing programs and practices?

CRITERIA	CORE QUESTIONS FOR DEVELOPERS	CORE QUESTIONS FOR USERS
User satisfaction	13. How would you characterize users' overall reaction to the innovation? What did they like best? What did they like least?	13. How would you describe your overall reaction to the innovation? what did you like best? What did you like least?
Individual growth	14. How has the innovation contributed to the individual growth of users?	14. How has participating in the innovation affected you personally?
Organizational change	15. How has the innovation contributed to organizational changes?	15. How has participating in the innovation affected your program? Your school? Your school system?
Societal effects	16. How would you summarize the most important long-term contributions of this innovation to improving society?	16. How would you summarize the most important long-term contributions of this innovation to improving society?

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